PROJECT MANUAL

VOLUME #1

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
Munfordville, Kentucky

SCB 2210 / BG# 23-277
JULY 2023

OWNER
Hart County Board of Education
Munfordville, Kentucky

SUPERINTENDENT – Nathan Smith

ARCHITECTS, CIVIL & STRUCTURAL ENGINEERS:
SHERMAN CARTER BARNHART ARCHITECTS, PLLC
144 TURNER COMMONS WAY, SUITE 110
LEXINGTON, KENTUCKY 40509
859-224-1351

MECHANICAL / ELECTRICAL / PLUMBING:
CMTA
10411 MEETING STREET
PROSPECT, KENTUCKY 40059
502-326-3085

STRUCTURAL ENGINEER:
POAGE ENGINEERS AND ASSOCIATES
880 SPARTA COURT, SUITE 200
LEXINGTON, KY 40504
859-255-9034

TABLE OF CONTENTS
VOLUME 1 of 3
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
BG #23-277
SCB PROJECT NO. 2210

Unless noted otherwise, the following shall apply to all manufacturers listed herein. Subject to compliance with Contract Documents, manufactures listed are approved as a manufacturer only. This does not imply that specific products supplied by such manufacturers have been reviewed and comply with requirements. It shall be the manufacturer's / contractor's responsibility to ensure that <u>all</u> requirements of the Contract Documents are met.

SECTION 000115 - LIST OF DRAWING SHEETS

PART 1 - List of Drawing Sheets

1.1 LIST OF DRAWINGS

A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled Legrande Elementary School Addition and Renovation as modified by subsequent Addenda and Contract modifications.

B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

SITE DRAWINGS

SS1.0	SITE SURVEY
DS1.0	DEMOLITION PLAN
SD1.0	SITE DEVELOPMENT PLAN
SD2.0	SITE GRADING & DRAINAGE PLAN
SD2.1	EROSION SEDIMENT CONTROL AND TRAFFIC CONTROL PLAN
SD3.0	SITE DETAILS
SD3.1	SITE DETAILS
SD4.0	SITE DETAILS
SD4.1	SITE DETAILS

STRUCTURAL DRAWINGS

S0.0	STRUCTURAL NOTES
S0.1	STRUCTURAL NOTES
S1.1	FOUNDATION PLAN
S2.1	ROOF FRAMING PLAN
S3.1	SECTIONS & DETAILS
S3.2	SECTIONS & DETAILS
S4.1	SECTIONS & DETAILS
S4.2	SECTIONS & DETAILS

ARCHITECTURAL DRAWINGS

D1.0	DEMOLITION PLAN, DETAILS & NOTES
A0.0	ABBREVIATIONS, SYMBOL LEGEND, GENERAL NOTES AND PARTITION TYPES
A1.0	FLOOR PLAN OVERALL
A1.1	ENLARGED PLAN AND DETAILS
A1.2	ENLARGED PLAN AND DETAILS
A1.3	ROOF PLAN AND DETAILS
A2.1	BUILDING ELEVATIONS & SECTIONS
A3.1	REFLECTED CEILING PLANS AND DETAILS
A4.1	DOOR SCHEDULE AND DOOR AND FRAME ELEVATIONS

FIRE PROTECTION DRAWINGS

FP0.1	FIRE PROTECTION LEGENDS AND DETAILS
FP1.0	FIRST FLOOR PLAN - FIRE PROTECTION DEMOLITION
FP1.1	FIRST FLOOR PLAN -FIRE PROTECTION

PLUMBING DRAWINGS

P0.1	PLUMBING LEGEND AND DETAILS
P1.1	BELOW SLAB PLAN – PLUMBING DEMOLITION

P1.2 FIRST FLOOR PLAN – PLUMBING DEMOLITION
P2.1 BELOW SLAB PLAN - PLUMBING
P2.2 FIRST FLOOR PLAN - PLUMBING
P3.1 ENLARGED KITCHEN PLAN – BELOW SLAB PLUMBING
P3.2 ENLARGED KITCHEN PLAN – PLUMBING
P3.3 ENLARGED MECHANICAL ROOM PLAN – PLUMBING
P4.1 SITE UTILITY PLAN – PLUMBING
P5.1 PLUMBING WASTE AND VENT RISER DIAGRAM

MECHANICAL DRAWINGS

M1.0 MECHANICAL LEGEND
M1.1 MECHANICAL ZONING PLAN
M2.1 FIRST FLOOR PLAN – MECHANICAL DEMOLITION
M2.2 FIRST FLOOR PLAN – HYDRONICS DEMOLITION
M2.3 ROOF PLAN – MECHANICAL DEMOLITION
M3.1 FIRST FLOOR PLAN – MECHANICAL NEW WORK
M3.2 ROOF PLAN – MECHANICAL NEW WORK
M4.0 BASEMENT FLOOR PLAN HYDRONICS
M4.1 FIRST FLOOR PLAN – HYDRONICS NEW WORK
M5.0 MECHANICAL DETAILS
M5.1 MECHANICAL DETAILS
M6.0 MECHANICAL SCHEDULES

ELECTRICAL DRAWINGS

E0.1 ELECTRICAL LEGEND AND GENERAL NOTES
ES.1 ELECTRICAL SITE PLAN
ED.1 FIRST FLOOR PLAN – ELECTRICAL DEMOLITION
E1.1 FIRST FLOOR PLAN – LIGHTING
E2.1 FIRST FLOOR PLAN – POWER
E3.1 FIRST FLOOR PLAN – SYSTEMS
E4.1 ENLARGED KITCHEN PLAN – ELECTRICAL
E5.1 ELECTRICAL DETAILS
E5.2 ELECTRICAL DETAILS
E5.3 ELECTRICAL DETAILS
E5.4 ELECTRICAL DETAILS
E5.5 DOOR DETAILS
E6.1 ELECTRICAL SCHEDULES
E6.2 PANEL SCHEDULES
E7.1 ELECTRICAL DISTRIBUTION RISER DIAGRAM
E7.2 FIRE ALARM RISER DIAGRAM

END OF SECTION 000115

SECTION 001113 - ADVERTISEMENT FOR BIDS

PART 1 - Advertisement for Bids

1.1 PROJECT INFORMATION

A. Notice to Bidders: Qualified bidders may submit bids for project as described in this Document. Submit bids according to the Instructions to Bidders.

B. Project Identification: Legrande Elementary School Addition and Renovation

1. Project Location: 70 Legrande School Road, Horse Cave, KY 42749

C. Owner: Har County Board of Education, 25 Quality Street, Munfordville, Kentucky 42765

D. Architect: Sherman Carter Barnhart Architects, Project Manager: Jennifer Cash (859) 224-1351.

E. Project Description: Scope includes construction of a kitchen and cafeteria and renovation within the building and to building systems and sanitary treatment facility.

F. Project cost range is anticipated to be under $7,000,000

G. Construction Contract: Bids will be received for the following Work:
1. General Contract (all trades) to be under one prime contractor.

1.2 BID SUBMITTAL AND OPENING

A. Owner will receive sealed lump sum bids until the bid time and date at the location given below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:

1. **Bid Date:** August 29, 2023
2. **Bid Time:** 2:30 pm (local time)
3. **Location**: Bid Opening to be conducted at the Hart County Board of Education

B. Bids will be thereafter publicly opened and read aloud.

1.3 BID SECURITY

A. Bid security shall be submitted with each bid in the amount of 5 percent of the bid amount. No bids may be withdrawn for a period of 60 days after opening of bids. Owner reserves the right to reject any and all bids and to waive informalities and irregularities. Bids received after the scheduled closing time for the receipt of bids will be returned unopened to the bidders. Any bids not submitted on the proper form shall not be considered.

1.4 PREBID MEETING

A. Prebid Meeting: To be held at Legrande Elementary School on August 17, 2023 at 2:00 PM Central Time.

1.5 DOCUMENTS

A. Printed Procurement and Contracting Documents: Obtain by contacting Lynn Imaging. Documents will be provided to prime bidders only; only complete sets of documents will be issued.

1. All documents are available electronically and once the low bidder is awarded then printed documents will be ordered for their use.

B. Viewing Procurement and Contracting Documents: Examine at the locations below:

1. Associate General Contractors, 2924 Foster Creighton Drive, Nashville, TN 37204.
2. Builders Exchange of Louisville, Inc., 2300 Meadow Drive, Louisville, KY 40218-1372
3. Plans available online at Construct Connect Plan Room https://www.constructconnect.com
4. Dodge Data and Analytics Plan Room online at https://www.construction.com/products/dodge-planroom

1.6 TIME OF COMPLETION AND LIQUIDATED DAMAGES

A. Successful bidder shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within the Contract Time. Work is subject to liquidated damages as indicated in Section 006100 - Supplementary Instructions to Bidders.

1.7 BIDDER'S QUALIFICATIONS

A. Successful bidders will be required to furnish and pay for satisfactory Performance and Labor and Material Payment Bonds. The bond shall cover the entire base bid cost and any accepted alternates.

B. Prevailing wage rates **will not** apply to this project.

END OF SECTION 001113

Kentucky Department of Education Version of AIA® Document A701™ – 1997

Instructions to Bidders

This version of AIA Document A701™–1997 is modified by the Kentucky Department of Education. Publication of this version of AIA Document A701–1997 does not imply the American Institute of Architects' endorsement of any modification by the Kentucky Department of Education. A comparative version of AIA Document A701–1997 showing additions and deletions by the Kentucky Department of Education is available for review on the Kentucky Department of Education Web site.

Cite this document as "AIA Document A701™– 1997, Instructions to Bidders — KDE Version," or "AIA Document A701™–1997 — KDE Version."

Kentucky Department of Education Version of AIA® Document A701™ – 1997

Instructions to Bidders

for the following PROJECT:
(Name and location or address)

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

This version of AIA Document A701–1997 is modified by the Kentucky Department of Education. Publication of this version of AIA Document A701 does not imply the American Institute of Architects' endorsement of any modification by the Kentucky Department of Education. A comparative version of AIA Document A701–1997 showing additions and deletions by the Kentucky Department of Education is available for review on the Kentucky Department of Education Web site.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

TABLE OF ARTICLES

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201™, or in other Contract Documents are applicable to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Form of Proposal for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids. The Base Bid shall include all labor, material, bonds, and the cost of all direct purchase orders for material to be purchased by the Owner

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

§ 2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

§ 2.1.2 The Bid is made in compliance with the Bidding Documents.

§ 2.1.3 The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

1. The submission of a Bid will be construed as evidence that a site visit and examination of local conditions have been made. Later claims for labor, equipment, or materials required or difficulties encountered which could have been foreseen had such an examination been made will not be recognized.

§ 2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Copies

§ 3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.

§ 3.1.2 (Not Used)

§ 3.1.3 Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

§ 3.1.4 The Owner and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

§ 3.2 Interpretation or Correction of Bidding Documents

§ 3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect and Construction Manager (if utilized) errors, inconsistencies or ambiguities discovered.

§ 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect and Construction Manager (if utilized) at least seven days prior to the date for receipt of Bids.

§ 3.2.3 Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

§ 3.3.2 No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.3 If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

§ 3.3.4 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to all who are known by the Architect and Construction Manager (if utilized) to have received a complete set of Bidding Documents.

§ 3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with the Bidding Documents.

§ 4.1.2 All blanks on the Form of Proposal shall be legibly executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

§ 4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change."

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall make no additional stipulations on the Form of Proposal nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

§ 4.2 Bid Security

§ 4.2.1 Each Bid greater ~~than $25,000~~ than $100,000.00 shall be accompanied by bid security in the form of a Bond provided by a Surety Company authorized to do business in the Commonwealth of Kentucky, or in the form of a certified check, and in an amount equal to at least five percent (5%) of the Base Bid amount, pledging that the Bidder will enter into a contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payments of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. **(Refer to attached KDE Directions on KDE Version of AIA Document AIA 701-1997 Instruction to Bidders June 3, 2017)**

§ 4.2.2 If a surety bond is required, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

§ 4.2.3 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected.

§ 4.3 Submission of Bids

§ 4.3.1 All copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids as indicated in the Advertisement or Invitation to Bid or any extensions thereof made by Addendum. Bids received after the closing time and date for receipt and opening of Bids will be rejected and returned to the Bidder unopened.

§ 4.3.3 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.4 Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.

§ 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

§ 4.4.3 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

§ 4.4.4 Bid security, if required, shall be in an amount sufficient for the Bid as resubmitted.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

At the discretion of the Owner, if stipulated in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be publicly opened and will be read aloud.

§ 5.2 Rejection of Bids

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

§ 5.3 Acceptance of Bid (Award) [Reference: KRS 45A.365]

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests.

§ 5.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

§ 6.1.1 Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

§ 6.1.2 In determining the qualifications and responsibilities of the Bidder, the Owner shall take into consideration the Bidder's skill**,** experience, facility, previous work standing, financial standing, capacity and ability to handle work in addition to that in progress, and quality and efficiency of construction plant and equipment proposed to be used on the project.

§ 6.2 (Not Used)

§ 6.3 Submittals

§ 6.3.1 Each Bidder shall submit as part of the Form of Proposal a list of subcontractors proposed for each major branch of work itemized and described in the specifications for the Project. The Bidder's listing of a subcontractor for a work category certifies that the subcontractor has in current employment, skilled staff and necessary equipment to complete that category. The Architect and Construction Manager (if utilized) will evaluate the ability of all listed subcontractors to complete the work and notify the Owner. Listing of the Bidder as the subcontractor may invalidate the Bid should the Architect's and Construction Manager's (if utilized) review indicate the bidder does not have skilled staff and equipment to complete the work category at the time the Bid was submitted.

.1 Changing subcontractors from those listed with the Form of Proposal is prohibited unless the bidder provides grounds for such a change that are consistent with provisions of the Instructions to Bidders. Said change shall be accompanied by a written explanation from the Bidder as well as a written release from the listed subcontractor. All letters shall be on original company stationary with original signatures from an officer in the company legally approved to act for the company. An unjustifiable change of subcontractors may invalidate the Bid. Any change to a proposed person or entity shall be addressed as noted in Section 6.3.3 of these Instructions to Bidders

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

§ 6.4 List of Materials, Suppliers, and Manufacturers

§ 6.4.1 Each Bidder shall submit a complete list of materials/equipment with supplier's and manufacturer's name in the form and manner indicated on the Form of Proposal and in compliance with materials and equipment specified.

§ 6.4.2 In addition to the list furnished with the Form of Proposal, the successful Bidder thereafter known as the Contractor, may be requested within thirty (30) calendar days after award of contract to furnish to the Architect and Construction Manager (if utilized) a more detailed and complete list of the materials and equipment, together with the manufacturer's or maker's name, brand and/or catalogue number, and product data or illustration thereof.

§ 6.4.3 Prior to the award of contract, the Architect and Construction Manager (if utilized) will make a preliminary check of the lists included with the Form of Proposal and advise the Bidder and the Owner of the acceptance thereof, and of such other actions as may be necessary in order to meet the requirements of the contract specifications. Should it develop that any of the materials or equipment named in the list do not meet the requirements of the project specifications, the Bidder shall be required to offer to the Owner other materials or equipment in compliance with the specifications at no change in contract price. Preliminary review and acceptance of the above list shall not relieve the Contractor of furnishing equipment and materials in accordance with the specifications.

§ 6.4.4 Written approval shall be obtained from the Architect regarding any material/equipment, supplier, and manufacturer substitution. Substitutions are permitted in the following instance:

.1 Failure to comply with contract requirements;
.2 Failure of the supplier or manufacturer to meet delivery schedules or other conditions of the contract;
.3 Written release by the supplier or manufacturer.

§ 6.4.5 The Owner reserves the right to reject the bid of any Bidder who fails to furnish the information required under Sections 6.3 and 6.4.

§ 6.5 Unit Prices

§ 6.5.1 Each Bidder shall submit as part of the Bid a list of unit prices as designated on the Form of Proposal.

§ 6.5.2 Unit prices are for changing or adjusting the scope or quantity of work from that indicated by the contract drawings and specifications.

§ 6.5.3 Unit prices shall include all labor, materials, equipment, appliances, supplies, overhead and profit.

§ 6.5.4 Only a single unit price per item shall be given and it shall apply for either more or less work than indicated or specified in the contract documents. In the event the contract is adjusted by unit prices, a change order shall be issued for the change and for the increased or decreased amount.

§ 6.5.5 Unit prices listed by the Bidder and accepted by the Owner shall apply to all phases of work whether the work is performed by the Bidder or by the Bidder's (Contractor's) subcontractors.

§ 6.5.6 For unit prices that apply to a lump sum Base Bid, the Owner reserves the right, prior to an award of contract, to negotiate, adjust and/or reject any price that is determined by the Architect, Construction Manager, or Owner to be excessive or unreasonable in amount.

§ 6.5.7 On line item total sum bids where Bidders are quoting firm unit prices for estimated quantities of units of work, the unit price is the Bid and is not subject to change, either by the Bidder or Owner. The Owner reserves the right to correct mathematical errors in extensions and additions by the Bidder. The Owner's corrected bid sum total shall take preference over the Bidder's computed bid sum total.

§ 6.6 Bid Division, Material Suppliers, and Purchase Orders

§ 6.6.1 This Section applies to projects with or without Bid Division (Multiple Prime Contracts), and those Projects that provide for direct purchase by the Owner of materials and equipment from Material Suppliers.

§ 6.6.2 For Projects with Bid Division: General Construction and Concrete, Masonry, Plumbing, HVAC and Electrical Contractors shall provide with their Bid a breakdown of major material items (excluding sales tax). This breakdown shall include description of the item, name of the manufacturer, name of the supplier, and the amount of the supplier's quote. The Owner will issue Purchase Orders direct to the suppliers for these materials. The following shall be provided:

.1 Within four (4) days from the Bid Date, the low Bidder shall furnish to the Owner the list of material suppliers of the items listed on the bid breakdown, with authorization given to the Contractor to quote the materials listed and that the Supplier will furnish the listed materials to the Owner under the Owner's standard Purchase Order for the amount stated on the Contractor's bid breakdown. Failure of any Contractor to provide this written list of material suppliers with authorization will cause forfeiture of the bid security.

.2 The Contractor shall also guarantee to the Owner that materials listed in the breakdown to be purchased directly by the Owner shall comply with requirements of the Contract Documents and that the quantity of such material is sufficient to complete the Bid Division. The Performance and Payment Bonds required of the Contractor shall be in the combined amount of the materials designated in its bid to be acquired by Purchase Order by the Owner and all remaining items of cost in the respective Bid Division. Contractor shall provide an invoice from the supplier to the Owner with Contractor's Application for Payment.

.3 Material Suppliers will be paid the full amount of their invoices. Retainage that would otherwise be withheld from invoices submitted by and paid to a material supplier shall be withheld from the approved payment request of the Contractor. Refer to General Conditions for further requirements regarding retainage.

.a Lockers, Library, Kitchen, Shop, Technology, Science or other major equipment bid divisions shall provide with their Bid a breakout price for the material portions of the Bid (excluding sales tax). Award of contract will be based on the lump sum price of the accepted Bid that includes labor and materials. The Owner will issue a Purchase Order for the material and a contract for the labor and incidental materials. Retainage will be held on both the Purchase Order and the Contract in accordance with the General Conditions.

.b The language of the Bid Divisions is designed to outline and define the work in general to be included in a particular Bid Division and to prevent overlapping and conflicting requirements within other Bid Divisions. No Bidder shall use the omission of any item from this language as a basis for a claim for additional cost when such item is specified or indicated to be part of a complete and workable system.

.c It is the responsibility of the Bidder to determine which Bid Division or combination of Bid Divisions the Bidder desires to Bid.

§ 6.6.3 For Projects without Bid Division but with direct purchase by the Owner of materials and equipment from Material Suppliers, Contractors shall comply with paragraph 6.6.2 above as applicable to the Project. The Owner will issue Purchase Orders direct to the suppliers for these materials. Award of contract will be based on the lump sum price of the accepted bid that includes labor and materials. Retainage will be held on both the Purchase Orders and the Contract(s) in accordance with the General Conditions.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 Unless stipulated otherwise in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds shall be executed by a surety company authorized to do business in Kentucky.

§ 7.1.2 The cost of such bonds shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312™–2010, Performance Bond and Payment Bond — KDE Version. Both bonds shall be written in the amount of the Contract Sum, being the total of the Base Bid, as described in Section 1.5 herein, and all Alternates accepted by the Owner.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101™–2007, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum — KDE Version, except for those Projects utilizing a Construction Manager the Agreement will be written on AIA Document A132™–2009, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Advisor Edition — KDE Version. Owner-Contractor Agreements shall be valid only after written notice by the Kentucky Department of Education that the proposed Agreements are approved.

~~ARTICLE 9 PUBLIC WORKS ACT [Reference: KRS 337.505 to 337.550]~~

§ 9.1 Labor Regulations **(Refer to attached KDE Directions Delete 9.1.1 and 9.1.2**

~~§ 9.1.1 Work shall be performed in compliance with applicable provisions of the Kentucky Prevailing Wage Act on Public Works Projects, KRS 337.505 through KRS 337.550.~~

~~§ 9.1.2 Prevailing wage rates, included with the Bidding Documents, shall be paid on this Project if required under Section 10.1.1. The stipulated wage rates represent prevailing minimum wage rates of pay allowable and shall not be construed to mean that higher rates may not have to be paid in order to secure labor.~~

§ 9.1.3 Any Bidder and/or subcontract bidder in violation of any wage or work act provision (KRS 337.510 to KRS 337.550) and under citation by the Kentucky Department of Labor is prohibited by KRS 337.990 from bidding on or working on any and all public works contracts either in their name or in the name of any other company, firm, or other entity in which there is vested interest. No Bid shall be submitted by a prime Bidder or sub-bidder in violation of KRS Chapter 337. The responsibility of the qualifications of the sub-contract Bidder is solely that of the prime Bidder. The rejection of the subcontract Bidder and resubmittal of a qualified subcontract Bidder shall be addressed per the provisions of these Instructions to Bidders relating to subcontract Bidders (subcontractors) and materials.

§ 9.2 Davis-Bacon Act Provisions

Projects funded with Federal Funds shall comply with the Davis-Bacon Act (Subchapter IV of Chapter 31 of the Title 40 of the United States Code). Where the amount received from federal revenue sharing is less than 25 percent of the estimated total construction cost of a public school project, state law and not the federal applies to the wage rate and the prevailing wage scale to be used for the project (OAG 74-329). Refer to Supplementary Conditions for direction regarding application of federal rates, if included in the bidding documents, to this project. In the event both state and federal wage rates apply, the higher of the two rates shall be used to determine labor costs.

ARTICLE 10 TAXES

§ 10.1 Kentucky Sales and/or Use Tax [Reference KRS 139.495(1)]

Bidders are informed that construction contracts of the Commonwealth of Kentucky and political subdivisions are not exempt from the provisions of the Kentucky Sales and/or Use Tax, unless provisions are clearly noted in the bidding documents for the direct purchase of certain materials and equipment by the Owner. Materials and equipment which are to be submitted for direct purchase are as noted by the Architect or Construction Manager in the Form of Proposal and shall be limited to forty (40) items with a minimum price of $5,000 each. All other materials and equipment shall be included in the Contract Price and are subject to Kentucky Sales and/or Use Taxes. Current Sales and/or Use Tax shall be provided for and included in the bid amount as no adjustment will be permitted nor made after the receipt of bids.

§ 10.2 Federal Excise Tax

The Commonwealth of Kentucky and its political subdivisions are exempt from Federal Excise Tax.

ARTICLE 11 POST BID REVIEW AND MATERIAL SUBMITTAL

§ 11.1 Representative at Bid Opening

§ 11.1.1 Each prime Bidder shall have an authorized representative at the bid opening for submittal of the list of materials and equipment, and the post bid review which follows immediately after the opening and reading of bids.

§ 11.1.2 Following the opening of bids, the three (3) apparent low Bidders shall remain for a post-bid review, and shall submit a completed list of materials, equipment and suppliers within one (1) hour from the close of the reading of the bids. The list of materials and equipment shall be the listing contained in the Form of Proposal.

§ 11.1.3 The post bid review, open to all bidders, will be conducted jointly with representatives of the Architect and Construction Manager (if utilized), Owner, and apparent low Bidder. Preliminary review will be directed toward Bidder's qualifications, list of subcontractors, list of materials and equipment, and unit prices.

ARTICLE 12 EQUAL EMPLOYMENT AND NONDISCRIMINATION

The Commonwealth of Kentucky and its political subdivisions are committed to equal job opportunities on public contracts and prohibited from discrimination based on race, creed, color, sex, age, religion, or national origin.

ARTICLE 13 CONFLICT OF INTEREST, GRATUITIES AND KICKBACKS, USE OF CONFIDENTIAL INFORMATION [Reference KRS 45A.455]

Conflict of Interest, Gratuities, Kickbacks, and Use of Confidential Information as described in KRS 45A.455 are expressly prohibited. Penalties for any violation under this statute are located in KRS 45A.990.

ARTICLE 14 KENTUCKY FAIRNESS IN CONSTRUCTION ACT OF 2007 [Reference KRS 371.400 to 371.425]

Projects constructed for school districts in the Commonwealth of Kentucky are subject to provisions of the Kentucky Fairness in Construction Act of 2007 as it relates to the right to litigate, the right to delay damages against the Owner, the right to file a mechanic's lien, prompt payment by Owners, amount of retainage that can be withheld and other provisions of the Act.

ARTICLE 15 KENTUCKY PREFERENCE LAW [Reference KRS 45A.490 to 45A.494]

§ 15.1 Projects constructed for school districts in the Commonwealth of Kentucky are subject to provisions of the reciprocal preference for Kentucky Preference for Resident Bidders law, KRS 45A.490 to KRS 45A.494. Reciprocal preference shall be given by public agencies to resident bidders.

§ 15.2 The Kentucky Finance and Administration Cabinet shall maintain a list of states that give to or require a preference for their own resident bidders, including details of the preference given to such bidders, to be used by public agencies in determining resident bidder preferences. The cabinet shall also promulgate administrative regulations in accordance with KRS Chapter 13A establishing the procedure by which the preferences required by this Section shall be given.

§ 15.3 The reciprocal preference as described in KRS 45A.490 to KRS 45A.494 above shall be applied in accordance with Kentucky Administrative Regulation 200 KAR 5:400.

KDE Directions on
Kentucky Department of Education Version of
AIA Document A701 – 1997
Instructions to Bidders
February 20, 2017

Modify Article 9 as follows:

Delete 9.1.1.
Delete 9.1.2.

KDE Directions on
Kentucky Department of Education Version of
AIA Document A701 – 1997
Instructions to Bidders
June 3, 2017

Modify Article 4 BIDDING PROCEDURES, Paragraph 4.2 Bid Security, Subparagraph 4.2.1 as follows:

"4.2.1 Each Bid greater than **$100,000** shall be accompanied by bid security in the form of a Bond provided by a Surety company authorized to do business in the Commonwealth of Kentucky, or in the form of a certified check, and in an amount equal to at least five percent (5%) of the Base Bid amount, pledging that the Bidder will enter into a contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payments of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds, if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty."

SECTION 002213 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

PART 1 - Supplementary Instructions to Bidders

1.1 INSTRUCTIONS TO BIDDERS

A. Instructions to Bidders for Project consist of the following:

1. AIA Document A701, "Instructions to Bidders," (KDE Version) a copy of which is bound in this Project Manual.
2. The following Supplementary Instructions to Bidders that modify and add to the requirements of the Instructions to Bidders.

1.2 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS, GENERAL

A. The following Supplementary Instructions to Bidders modify or add to the AIA Document A701-1997 INSTRUCTIONS TO BIDDERS (KDE Version). Where any Article of the Instructions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these supplements, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.

1.3 ARTICLE 1 - DEFINITIONS

A. Add Section 1.10.

1. 1.10 - A Material Supplier is the person or entity who has a direct contractual responsibility to the Owner to furnish designated materials described within the Bid Package Summary in accordance with governing provisions of the Contract.

1.4 ARTICLE 2 - BIDDER'S REPRESENTATIONS

A. Add Section 2.1.3.2:

1. 2.1.3.2 - The Bidder has investigated all required fees, permits, and regulatory requirements of authorities having jurisdiction and has properly included in the submitted bid the cost of such fees, permits, and requirements not otherwise indicated as provided by Owner.

B. Add Section 2.1.5:

1. 2.1.5 - The Bidder has incorporated into the Bid adequate sums for work performed by installers whose qualifications meet those indicated in the Procurement and Contracting Documents.

1.5 ARTICLE 3 - BIDDING DOCUMENTS

A. 3.2 - Interpretation or Correction of Procurement and Contracting Documents:

1. Add Section 3.2.2.1:

a. 3.2.2.1 - Submit Bidder's Requests for Interpretation using form bound in the Project Manual.

2. Add the Section 3.2.4:

a. 3.2.4 - WORK REASONABLE INFERRED, BUT NOT PARTICULARLY DELINEATED OR SPECIFIED: The Contractor shall study all drawings and specifications and all conditions relating to the erection of the work, and if any materials or labor evidently necessary for the proper and complete execution of the work, which are not specifically mentioned and included in the drawings and specifications, although reasonably inferred therefrom, unless eliminated by special mention, or if any error or inconsistency appears therein, or in the event of a doubt arising as to the true intent and meaning of the drawings or specifications, he shall report it to the Architect at least four (4) days in advance of the date for receiving the bid. The Architect will then issue an addendum containing the proper information to all Contractors, to assure fair competition. In case the Contractor fails to make such report and the Architect is not otherwise advised of such doubtful matter, the Contractor is hereby made responsible for the furnishing of the necessary labor and material reasonable inferred or evidently necessary for the proper execution and completion of the work; for any additional work involved in the correction of apparent errors or inconsistencies and in executing the true extent and meaning of the drawings and specifications as interpreted by the Architect, and all such labor and materials shall be provided at the Contractor's expense and under no condition will any such labor and material be allowed as an extra.

3. Add Section 3.2.5:

a. 3.2.5 - DISCREPANCIES: Anything called for in the specifications and not shown on the drawings or shown on the drawings and not called for in the specifications shall be included in both. Where the details and general drawings do not agree, the Contractor shall notify the Architect at least four (4) days before the date of the receipt of bids and the Architect will issue an Addendum to all Contractors as to which of the two methods of construction shall be followed. Failure to make this determination shall make the Contractor subject to furnishing either method as may be later called for by the Architect. In case of discrepancies between the various parts of the plans and specifications. The Contractor shall furnish either method as may be determined by the Architect.

B. 3.4 - Addenda:

1. Add Section 3.4.5:

a. 3.4.5 - Examine bidding documents carefully prior to date for receipt of bids, make written request to Architect for true meaning of any part of contract documents, for interpretation and correction of any ambiguity, inconsistency or error therein. All interpretations and corrections will be included in an addendum issued by Architect. Contractor's written questions can be sent by photo facsimile to **Jennifer Cash, AIA** at Sherman-Carter-Barnhart Architects (859) 224-8446 for interpretation up to and through **four (4) days prior to bid submission date**. Only a written interpretation or correction by addendum shall be binding. No Bidder shall reply upon interpretations or corrections given by any other method.

1.6 ARTICLE 6 - POSTBID INFORMATION

A. 6.3 - Submittals

1. Add Section 6.3.1.2:

a. 6.3.1.2 - The listing of more than one subcontractor in a work category shall invalidate bid.

1.7 ARTICLE 8 – FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

A. Add the following Sections:

1. 8.1 - Subsequent to the Notice of Intent to Award, and within 10 days after the prescribed Form of Agreement is presented to the Awardee for signature, the Awardee shall execute and deliver the Agreement to Owner through Architect, in such number of counterparts as Owner may require.
2. 8.2 - Owner may deem as a default the failure of the Awardee to execute the Contract and to supply the required bonds when the Agreement is presented for signature within the period of time allowed.
3. 8.3 - Unless otherwise indicated in the Procurement and Contracting Documents or the executed Agreement, the date of commencement of the Work shall be the date of the executed Agreement.
4. 8.4 - In the event of a default, Owner may declare the amount of the Bid security forfeited and elect to either award the Contract to the next responsible bidder or re-advertise for bids.

1.8 ARTICLE 10 - TAXES

A. 10.1 Kentucky Sales and Or Use Tax

1. Add the following Sections:

a. 10.1.1 - As provided by KRS 139.3 10 and Kentucky Administrative Regulation 103, AR26:070 Contract Construction. Each Contractor is responsible for Kentucky Sales Tax and Use Tax on all materials purchased and installed by Contractor or a third party hired by the Contractor. For those bid packages identified as supplier only or contractor/supplier (containing bid breakout items) the sales and use taxes to be excluded only on those material items purchased by the Owner directly from the material supplier. If a Contactor lists his own company as the supplier on those bid packages containing bid breakout items, the Owner will not issue a purchase order and exemption certificate. Accordingly, the sales and use tax on the materials used to fulfill the terms of the Contract will be the liability of the Contractor.

b. 10.1.2 - The material breakout amount indicated by the perspective bidder on the bid form is considered final The KDE material supplier authorization form stipulates the cost of the material is validated by the signature of the supplier. In order to qualify for tax exemption, the Revenue Cabinet requires that the bid for the labor component and material component for a given bid package remains separate. However, upon completion of the project, if the Contractor has not submitted invoices totaling the value of a purchase order, that purchase order shall be considered complete and closed, with the balance left in the purchase order reverting to the Owner.

END OF SECTION 002213

CERTIFICATE OF PRODUCT COMPLIANCE FOR
PROPOSED SUBSTITUTED PRODUCTS

To: Sherman Carter Barnhart Architects, PLLC
Jennifer Cash, AIA
144 Turner Commons Way, Suite 110
Lexington, KY 40508
Phone (859) 224-1351 Fax (859) 224-8446

I, _____, being a duly authorized representative of
(Name)

_____, the manufacturer, and/or distributor, and/or sales
(Company Name)

representative of _____, do hereby certify that the above named
(Product Name)

product complies in strict accordance with the Contract Documents and Specifications for the

construction of _____ located in
(Project Name)

_____ and that the product is compatible and fit for the
(Project Address)

intended use and incorporation into this project. Further, I understand that the Architect and Owner may rely on this certification.

Submittal of this form is not intended to be considered a formal approval of proposed substitution. All approved substitutions prior to bid must be incorporated into Contract Documents via formal addenda. Substitution requests made during construction shall be submitted for approval per Specification Section 012500. Approval or substitution requests via Specification Sections 002600 and 012500 do not imply that specific products supplied by such manufacturers have been reviewed and comply with requirements. It shall be the manufacturer's / contractor's responsibility to ensure that all requirements of the Contract Documents are met.

Signature: _____ Date:_____

SECTION 002600 - PROCUREMENT SUBSTITUTION PROCEDURES

PART 1 - Procurement Substitution Procedures

1.1 DEFINITIONS

A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.

B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 012500 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

1.2 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.3 PROCUREMENT SUBSTITUTIONS

A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.

B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:

1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
3. The request is fully documented and properly submitted.

1.4 SUBMITTALS

A. Procurement Substitution Request: Submit to Architect. Procurement Substitution Request must be made in writing in compliance with the following requirements:

1. Requests for substitution of materials and equipment will be considered if received no later than 5 days prior to date of bid opening.

B. Architect's Action:

1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

C. Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF SECTION 002600

KENTUCKY DEPARTMENT OF EDUCATION **FORM OF PROPOSAL**
702 KAR 4:160

BG No. 23-277
Date: _____ To: (Owner) Hart County Board of Education

Project Name: LeGrande Elementary School Addition and Renovation Bid Package No. _____

City, County: Horse Cave, Hart

Name of Contractor: _____

Mailing Address: _____

Business Address: _____Telephone:_____

Having carefully examined the Instructions to Bidders, Contract Agreement, General Conditions, Supplemental Conditions, Specifications, and Drawings, for the above referenced project, the undersigned bidder proposes to furnish all labor, materials, equipment, tools, supplies, and temporary devices required to complete the work in accordance with the contract documents and any addenda listed below for the price stated herein.

Addendum _____ (Insert the addendum numbers received or the word "none" if no addendum received.)

BASE BID: For the construction required to complete the work, in accordance with the contract documents, I/We submit the following lump sum price of: _____

Use Figures

_____ Dollars & _____Cents

Use Words for both dollars and cents

ALTERNATE BIDS: (If applicable and denoted in the Bidding Documents)

For omission from or addition to those items, services, or construction specified in Bidding Documents by alternate number, the following lump sum price will be added or deducted from the base bid.

Alternate Bid No.	**Alternate Description** *(Refer to Section 12300-Alternates for additional information)*	**+ (Add to the Base Bid)**	**- (Deduct from the Base Bid)**	**No Cost Change (from the Base Bid)**
Alt. Bid No. 1	Cafeteria flooring to be premium vinyl tile and base (not terrazzo)			
Alt. Bid No. 2	Provide Owner-preferred Sloan auto-flush valves			
Alt. Bid No. 3	Provide Owner-preferred Best locks for door hardware			

A maximum of 10 Alternate Bids will be acceptable with each Base Bid. Do not add supplemental sheets for Alternate Bids to this document.

LIST OF PROPOSED SUBCONTRACTORS:
List on the lines below each major branch of work and the subcontractor involved with that portion of work. If the branch of work is to be done by the Contractor, so indicate.

The listing of more than one subcontractor in a work category shall invalidate the bid.

The listing of the bidder as the subcontractor for a work category certifies that the bidder has in current employment, skilled staff and necessary equipment to complete that category. The architect/engineer will evaluate the ability of all listed subcontractors to complete the work and notify the owner. Listing of the bidder as the subcontractor may invalidate the bid should the architect's review indicate bidder does not have skilled staff and equipment to complete the work category at the time the bid was submitted.

A maximum of 40 subcontractors will be acceptable with each bid. Do not add supplemental sheets for subcontractors to this document.

The bidder shall submit the list of subcontractors with the bid.

	BRANCH OF WORK (to be filled out by the Architect)	**SUBCONTRACTOR** (to be filled out by the contractor)
1.	Excavation	
2.	Termite Control	
3.	Masonry	
4.	Water Repellents	
5.	Structural Concrete	
6.	Steel Erection	
7.	Miscellaneous Metals	
8.	Metal framing and Gypsum Board	
9.	Wall Insulation	
10.	Silicone-Coated Polyurethane Foam Roof System	
11.	Sheet Metal (Fascia / Gutters / Downspouts / Trim	
12.	Canopies	
13.	Roof Access Ladders	
14.	Coiling Shutter	
15.	Aluminum Storefronts and Entrance Systems	
16.	HM Doors and Frames	
17.	Wood Doors	

	BRANCH OF WORK (to be filled out by the Architect)	**SUBCONTRACTOR** (to be filled out by the Contractor)
18.	Door Hardware	
19.	Suspended Acoustical Ceiling Systems	
20.	Terrazzo Flooring and Base	
21.	VCT Flooring and Base	
22.	Interior Painting	
23.	Exterior Painting	
24.	Fire Extinguishers and Cabinets	
25.	Manufactured Casework and Countertops	
26.	Tack Boards and Marker Boards	
27.	Toilet Partitions	
28.	Toilet Accessories	
29.	Signage	
30.	Foor Service Equipment	
31.	Exterior Railings	
32.	Site Concrete (Sidewalks / Ramps / Platforms / Retaining Walls / Cheekwalls / Steps	
33.	Fencing and Gates	
34.	Asphaltic Paving	
35.	Controls	
36.	Communication	
37.	Electrical	
38.	Fire Alarm	
39.	Mechanical	
40.	Fire Suppression Sprinkler System	
41.	Plumbing	
42.		

LIST OF PROPOSED SUPPLIERS AND MANUFACTURERS:

List on the lines below each major material category for this project and the suppliers and manufacturers involved with that portion of work. Listing the supplier below means the Contractor is acknowledging authorization from the Supplier to include the Supplier in this bid.

The listing of more than one supplier or manufacturer in a material category shall invalidate the bid.

A maximum of 40 suppliers and manufacturers will be acceptable with each bid. Do not add supplemental sheets for suppliers to this document.

The bidder shall submit the list of suppliers and manufacturers within one (1) hour of the bid.

	MATERIAL DESCRIPTION BY SPECIFICATION DIVISION AND CATEGORY (to be filled out by the Architect or Contractor)	**SUPPLIER** (to be filled out by the Contractor)	**MANUFACTURER** (to be filled out by the Contractor)
1.	Termite Control		
2.	Concrete		
3.	CMU		
4.	Face Brick		
5.	Water Repellents		
6.	Steel Beams		
7.	Steel Joists		
8.	Steel Decking		
9.	Silicone-Coated Polyurethan Foam Roof System		
10.	Roof Walkway Pads		
11.	Rigid Roof Insulation		
12.	Canopies		
13.	Roof Ladders		
14.	Metal Framing		
15.	Gypsum Board		
16.	Wall Insulation		
17.	Coiling Shutter		

18.	Aluminum Storefronts and Entrance Systems	
19.	HM Doors and Frames	
20.	Wood Doors	
21.	Door Hardware	
22.	Interior and Exterior Glass and Glazing	
23.	Shades (Between Glass in Vision Lights of Doors)	
24.	Suspended Acoustical Ceiling Systems	
25.	Terrazzo Flooring and Base	
26.	VCT Flooring and Base	
27.	Interior Painting	
28.	Exterior Painting	
29.	Fire Extinguishers and Cabinets	
30.	Manufactured Casework and Countertops	
31.	Tack Boards and Marker Boards	
32.	Toilet Partitions	
33.	Toilet Accessories	
34.	Signage	
35.	Food Service Equipment	
36.	Exterior Railings	
37.	Fencing and Gates	
38.	Kitchen Hood	
39.	Plumbing Fixtures (Provide Complete Listing)	
40.	Plumbing (Provide Complete Listing)	

UNIT PRICES:

Indicate on the lines below those unit prices to determine any adjustment to the contract price due to changes in work or extra work performed under this contract. The unit prices shall include the furnishing of all labor and materials, cost of all items, and overhead and profit for the Contractor, as well as any subcontractor involved. These unit prices shall be listed in units of work.

A maximum of 40 unit prices will be acceptable with each bid. Do not add supplemental sheets for unit pricing to this document.

The bidder shall submit the list of unit prices within one (1) hour of the bid.

	WORK (to be filled out by the Architect)	**PRICE / UNIT** (to be filled out by the Contractor)	**UNIT** (to be filled out by the Contractor)
1.	DGA		/ton
2.	#2 KYTC Stone		/ton
3.	Mass Earth		/cy
4.	12"PE Storm Piping (6' Deep)		/lf
5.	Downspout Boot		/ea
6.	6 oz. Non-Woven Filter Fabric		/syd
7.	4" Concrete Sidewalks (Including Prep & Stone)		/sy
8.	Asphalt Paving Including Store – Light Duty		/sy
9.	Asphalt paving including stone – heavy duty		/sy
10.	Pipe Bollard		/ea
11.	Chain Link Fence		/lf
12.	VCT Flooring		/sf
13.	VCT Base		/lf
14.	Suspended Acoustical Ceiling System (Type A)		/sy
15.	Interior Painting		/sf
16.	3/4" EMT Conduit, Installed		/lf
17.	1" EMT Conduit, Installed		/lf
18.	3 #12 Conductor, Installed		/lf
19.	Duplex Receptacle, Installed		/ea

	WORK (to be filled out by the Architect)	**PRICE / UNIT** (to be filled out by the Contractor)	**UNIT** (to be filled out by the Contractor)
20.	GFI Receptacle, Installed		/ea
21.	Quad Receptacle, Installed		/ea
22.	120 Volt, 20 Amp, Single Pole Circuit Breaker, Installed		/ea
23.	Fire Alarm A/V Unit, Installed		/ea
24.	Fire Alarm Pull Station, Installed		/ea
25.	Duct Mounted Smoke Detector, Installed		/ea
26.	Light Fixture, Installed (Provide Complete Listing)		/ea
27.	Exit Sign, Installed		/ea
28.	Voice / Data Outlet with 2 Category 6A RJ-45 Jacks, Installed		/ea
29.	Category 6A UTP Cable, Installed in Conduit		/lf
30.			
31.			
32.			
33.			
34.			
35.			
36.			
37.			
38.			
39.			
40.			

DIRECT MATERIAL PURCHASES:

Indicate on the lines below those materials to be purchased directly by the Owner with a Purchase Order to be issued by the Owner to the individual suppliers. The value of the direct Purchase Order cannot be less than $5,000. Following the approval of bids, the Contractor shall formalize this list by completing and submitting the electronic Purchase Order Summary Form provided by KDE. Listing the supplier below means the Contractor is acknowledging authorization from the Supplier to include the Supplier in this bid.

A maximum of 50 POs will be acceptable with each bid. Do not add supplemental sheets for additional POs to this document.

The bidder shall submit the list of Purchase Orders within four (4) days of the bid.

	SUPPLIER (to be filled out by the Contractor)	**PURCHASE ORDER DESCRIPTION** (to be filled out by the Contractor)	**PURCHASE ORDER AMT.** (to be filled out by the Contractor)
1.	Stone		
2.	Concrete		
3.	Termiticide		
4.	Water Repellent		
5.	Masonry		
6.	Structural Steel		
7.	Steel Decking		
8.	Steel Decking		
9.	Rigid Roof Insulation		
10.	Silicone-Coated Polyurethane Foam Roofing System		
11.	Sheet Metal		
12.	Canopies		
13.	Roof Access Ladders		
14.	Coiling Shutter		
15.	Aluminum Storefronts and Entrance Systems		
16.	HM Doors and Frames		
17.	Wood Doors		
18.	Door Hardware		

	SUPPLIER (to be filled out by the Contractor)	**PURCHASE ORDER DESCRIPTION** (to be filled out by the Contractor)	**PURCHASE ORDER AMT.** (to be filled out by the Contractor)
19.	Suspended Acoustical Ceiling Systems		
20.	Terrazzo Flooring and Base		
21.	VCT Flooring and Base		
22.	Painting		
23.	Fire Extinguishers and Cabinets		
24.	Manufactured Casework and Countertops		
25.	Tack Boards and Marker Boards		
26.	Toilet Partitions		
27.	Toilet Accessories		
28.	Signage		
29.	Food Service Equipment		
30.	Railings		
31.	Fencing and Gates		
32.	Asphaltic Paving		
33.	Plumbing		
34.	Mechanical Systems		
35.			
36.			
37.			
38.			
39.			
40.			
41.			
42.			
43.			

	SUPPLIER (to be filled out by the Contractor)	**PURCHASE ORDER DESCRIPTION** (to be filled out by the Contractor)	**PURCHASE ORDER AMT.** (to be filled out by the Contractor)
44.			
45.			
46.			
47.			
48.			
49.			
50.			

TIME LIMIT FOR EXECUTION OF CONTRACT DOCUMENTS:

In the event that a bidder's proposal is accepted by the Owner and such bidder should fail to execute the contract within ten (10) consecutive days from the date of notification of the awarding of the contract, the Owner, at his option, may determine that the awardee has abandoned the contract. The bidder's proposal shall then become null and void, and the bid bond or certified check which accompanied it shall be forfeited to and become the property of the Owner as liquidated damages for failure to execute the contract.

The bidder hereby agrees that failure to submit herein above all required information and/or prices can cause disqualification of this proposal.

Submitted by:

NAME OF CONTRACTOR / BIDDER: _____

AUTHORIZED REPRESENTATIVE'S NAME:_____
Signature

AUTHORIZED REPRESENTATIVE'S NAME(printed): _____

AUTHORIZED REPRESENTATIVE'S TITLE: _____

NOTICE: Bid security must accompany this proposal if the Base Bid price is greater than ~~of $25,000.~~ $100,000. (change effective June 3, 2019.)

This form shall not be modified.

SECTION 004313 - BID SECURITY FORMS

PART 1 - Bid Security Forms

1.1 BID FORM SUPPLEMENT

A. A completed bid bond form is required to be attached to the Bid Form and has been included in this section for reference.

1.2 BID BOND FORM

A. AIA Document A310, "Bid Bond," is the recommended form for a bid bond. AIA Document A312- "Performance Bond" is the recommended form for the performance bond, and both forms have been included in this section for your reference. A bid bond acceptable to Owner and Performance Bond are required to be attached to the Bid Form as supplements.

B. Copies of AIA standard forms may be obtained from The American Institute of Architects;www.aia.org/contractdocs/purchase/index.htm;

C. email: docspurchases@aia.org; (800) 942-7732.

END OF SECTION 004313

SECTION 004373 - PROPOSED SCHEDULE OF VALUES FORM

PART 1 - Proposed Schedule of Values Form

1.1 BID FORM SUPPLEMENT

A. A completed Proposed Schedule of Values form is required to be submitted by the successful bidder after the execution of the construction contract, a minimum of twenty-one (21) days prior to the contractor's first application for payment.

1.2 PROPOSED SCHEDULE OF VALUES FORM

A. Proposed Schedule of Values Form: Provide a breakdown of the bid amount, including alternates, in enough detail to facilitate continued evaluation of bid. Coordinate with the Project Manual table of contents. Provide multiple line items for principal material and subcontract amounts in excess of five percent of the Contract Sum.

B. Arrange schedule of values consistent with format of AIA Document G703, AIA Documents G702 and G703 included in this section.

1. Copies of AIA standard forms may be obtained from the American Institute of Architects; http://www.aia.org/contractdocs/purchase/index.htm; docspurchases@aia.org; (800) 942-7732.

END OF SECTION 004373

AIA® Document G702™ – 1992

Application and Certificate for Payment

TO OWNER:	**PROJECT:**	**APPLICATION NO:**	**Distribution to:**
		PERIOD TO:	OWNER: ☐
		CONTRACT FOR: General Construction	ARCHITECT: ☐
FROM CONTRACTOR:	**VIA ARCHITECT:**	**CONTRACT DATE:**	CONTRACTOR: ☐
		PROJECT NOS: / /	FIELD: ☐
			OTHER: ☐

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM		$ 0.00
2. NET CHANGE BY CHANGE ORDERS		$ 0.00
3. CONTRACT SUM TO DATE (Line 1 ± 2)		$ 0.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)		$ 0.00
5. RETAINAGE:		
a. 0 % of Completed Work (Column D + E on G703)	$ 0.00	
b. 0 % of Stored Material (Column F on G703)	$ 0.00	
Total Retainage (Lines 5a + 5b or Total in Column I of G703)		$ 0.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 Less Line 5 Total)		$ 0.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)		$ 0.00
8. CURRENT PAYMENT DUE		$ 0.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)	$ 0.00	

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$ 0.00	$ 0.00
Total approved this Month	$ 0.00	$ 0.00
TOTALS	$ 0.00	$ 0.00
NET CHANGES by Change Order	$ 0.00	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:

County of:

Subscribed and sworn to before me this day of

Notary Public:

My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED ..... $ 0.00

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

AIA® Document G703™ – 1992

Continuation Sheet

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT,
containing Contractor's signed certification is attached.
In tabulations below, amounts are stated to the nearest dollar.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
			FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD					
	GRAND TOTAL	$ 0.00	$ 0.00	$ 0.00	$ 0.00	$ 0.00	0.00 %	$ 0.00	$ 0.00

SECTION 004393 - BID SUBMITTAL CHECKLIST

PART 1 - Bid Submittal Checklist

1.1 BID INFORMATION

A. Bidder: _____

B. Prime Contact: _____

C. Project Name: Legrande Elementary School Addition and Renovation

D. Project Location: 70 Legrande School Road, Horse Cave, Kentucky 42749

E. Owner: Hart County Board of Education

F. Architect: Sherman Carter Barnhart Architects, Jennifer Cash, AIA

G. Architect Project Number: 2210

1.2 BIDDER'S CHECKLIST

A. In an effort to assist the Bidder in properly completing all documentation required, the following checklist is provided for the Bidder's convenience. The Bidder is solely responsible for verifying compliance with bid submittal requirements.

B. Attach this completed checklist to the outside of the Submittal envelope.

1. Used the Bid Form provided in the Project Manual.
2. Prepared the Bid Form as required by the Instructions to Bidders.
3. Indicated on the Bid Form the Addenda received.
4. Attached to the Form of Proposal: Form of Proposal Attachment.
5. Attached to the Bid Form: Bid Bond OR a certified check for the amount required.
6. Bid envelope shows name and address of the Bidder.
7. Bid envelope shows name of Project being bid.
8. Bid envelope shows name of Prime Contract being bid, if applicable.
9. Bid envelope shows time and day of Bid Opening.
10. Verified that the Bidder can provide executed Performance Bond and Labor and Material Bond.
11. Verified that the Bidder can provide Certificates of Insurance in the amounts indicated.

END OF SECTION 004393

SECTION 006000 - FORMS

PART 1 - Forms

1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:
   1. AIA Document A101, "Standard Form of Agreement between Owner and Contractor, Stipulated Sum."
      a. The General Conditions for Project are AIA Document A201, "General Conditions of the Contract for Construction."
   2. The General Conditions are included in the Project Manual.
   3. The Supplementary Conditions for Project are separately prepared and included in the Project Manual.
   4. Owner's document(s) bound following this Document.

1.2 ADMINISTRATIVE FORMS

A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.

B. Copies of AIA standard forms may be obtained from the American Institute of Architects; http://www.aia.org/contractdocs/purchase/index.htm; docspurchases@aia.org; (800) 942-7732.

C. Preconstruction Forms:
   1. Form of Performance Bond and Labor and Material Bond: AIA Document A312, "Performance Bond and Payment Bond."

D. Information and Modification Forms:
   1. Form for Requests for Information (RFIs): AIA Document G716, "Request for Information (RFI)."
   2. Form of Request for Proposal: AIA Document G709, "Work Changes Proposal Request."
   3. Change Order Form: AIA Document G701, "Change Order."
   4. Form of Architect's Memorandum for Minor Changes in the Work: AIA Document G707, "Architect's Supplemental Instructions."
   5. Form of Change Directive: AIA Document G714, "Construction Change Directive."

E. Payment Forms:
   1. Form of Agreement Between Owner and Contractor: AIA Document A101, "Standard Form of Agreement Between Owner and Contractor" (KDE Version)
   2. KDE Purchase Order Summary Form
   3. KDE Purchase Order & Instructions ((702 KAR 4:160)
   4. Form of General Conditions for Construction: AIA Document A201, "General Conditions of the Contract for Construction" (KDE Version)
   5. Form of Contractor's Affidavit: AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
   6. Form of Affidavit of Release of Liens: AIA Document G706A, "Contractor's Affidavit of Payment of Release of Liens."
   7. Form of Consent of Surety: AIA Document G707, "Consent of Surety to Final Payment."

8. Form of Requests for Clarification: AIA Document G716, "Contractor's Request for Information"
9. Form of Transmittal Letter: AIA Document G810, “Transmittal Letter”

END OF SECTION 006000

Kentucky Department of Education Version of AIA® Document A101™ – 2007

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

This version of AIA Document A101™–2007 is modified by the Kentucky Department of Education. Publication of this version of AIA Document A101–2007 does not imply the American Institute of Architects' endorsement of any modification by the Kentucky Department of Education. A comparative version of AIA Document A101–2007 showing additions and deletions by the Kentucky Department of Education is available for review on the Kentucky Department of Education Web site.

Cite this document as "AIA Document A101™–2007, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum — KDE Version," or "AIA Document A101™–2007 — KDE Version."

Kentucky Department of Education Version of AIA® Document A101 – 2007

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the day of
in the year
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

The Architect:
(Name, legal status, address and other information)

The Owner and Contractor agree as follows.

KENTUCKY DEPARTMENT OF EDUCATION
Every Child Proficient and Prepared for SUCCESS

This version of AIA Document A101–2007 is modified by the Kentucky Department of Education. Publication of this version of AIA Document A101 does not imply the American Institute of Architects' endorsement of any modification by the Kentucky Department of Education. A comparative version of AIA Document A101–2007 showing additions and deletions by the Kentucky Department of Education is available for review on the Kentucky Department of Education Web site.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Init.
/

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Owner direct Purchase Orders, Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.

(Insert the date of commencement if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

If, prior to the commencement of the Work, the Owner requires time to file mortgages and other security interests, the Owner's time requirement shall be as follows:

§ 3.2 The Contract Time shall be measured from the date of commencement.

§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than ( ) days from the date of commencement, or as follows:

(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work. Either list requirements for earlier Substantial Completion here or refer to an exhibit attached to this Agreement.)

Portion of Work	Substantial Completion Date

, subject to adjustments of this Contract Time as provided in the Contract Documents.

Liquidated Damages: As actual damages for delay in completion of Work are impossible to determine, the Contractor and his Surety shall be liable for and shall pay to the Owner the sum of

($), not as a penalty, but as fixed, agreed and liquidated damages for each calendar day of delay until the Contract Work is substantially completed as defined in the General Conditions of the Contract for Construction. The Owner shall have the right to deduct liquidated damages from money in hand otherwise due, or to become due, to the Contractor, or to sue and recover compensation for damages for failure to substantially complete the Work within the time stipulated herein. Said liquidated damages shall cease to accrue from the date of Substantial Completion.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be

($), subject to additions and deductions as provided in the Contract Documents.

(List the base bid amount, sum of accepted alternates, total construction cost (the sum of base bid amount plus sum of accepted alternates), sum of Owner's direct Purchase Orders. The Contract Sum shall equal the sum of Total Construction Cost, less Owner direct Purchase Orders. Either list this information here or refer to an exhibit attached to this Agreement.)

	Amount
Base Bid	$
Sum of Accepted Alternates	$
Total Construction Cost (the sum of base bid amount plus sum of accepted alternates)	$
Sum of Owner's direct Purchase Orders	$
Contract Sum (total construction cost less Owner direct Purchase Orders)	$

§ 4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires. Either list alternates here or refer to an exhibit attached to this Agreement.)

Number	Item Description	Amount
	Total of Alternates	

§ 4.3 Unit prices, if any:
(Identify and state the unit price; state quantity limitations, if any, to which the unit price will be applicable. Either list unit prices here or refer to an exhibit attached to this Agreement.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.4 Allowances included in the Contract Sum, if any:
(Identify allowance and state exclusions, if any, from the allowance price. Either list allowances here or refer to an exhibit attached to this Agreement.)

Item	Price

ARTICLE 5 PAYMENTS

§ 5.1 PROGRESS PAYMENTS

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the certified amount to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment.

State law (KRS 371.405) requires the Owner to pay undisputed Applications for Payment within forty-five (45) business days following receipt of the invoices. If the Owner fails to pay the Contractor within forty-five (45) business days following receipt of an undisputed Application for Payment, state law requires the Owner shall pay interest to the Contractor beginning on the forty-sixth business day after receipt of the Application for Payment, computed at the rate required by state law.

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

.1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of percent (%). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201™–2007, General Conditions of the Contract for Construction — KDE Version;

.2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage of percent (%);

.3 Subtract the aggregate of previous payments made by the Owner; and

.4 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201–2007 — KDE Version.

§ 5.1.7 The progress payment amount determined in accordance with Section 5.1.6 shall be further modified under the following circumstances:

.1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and
(Section 9.8.5 of AIA Document A201–2007 — KDE Version requires release of applicable retainage upon Substantial Completion of Work with consent of surety, if any.)

.2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of AIA Document A201–2007 — KDE Version.

§ 5.1.8 Reduction or limitation of retainage, if any, shall be as follows:
When Owner direct Purchase Orders are used, retainage that would otherwise be held on materials and equipment shall transfer to the Contractor, and the material suppliers will be paid the full amount of their invoices. The Owner shall retain ten percent (10%) from each Application for Payment, and an amount equal to ten percent (10%) of approved Purchase Order payments, up to fifty percent (50%) completion of the Work, then provided the Work is on schedule and satisfactory, and upon written request of the Contractor together with consent of surety and the recommendation of the Architect, the Owner shall approve a reduction in Retainage to five percent (5%) of the current Contract Sum plus Purchase Orders. No part of the five percent (5%) retainage shall be paid until after Substantial Completion of the Work, as defined in the General Conditions of the Contract for Construction. After Substantial Completion, if reasons for reduction in retainage are certified in writing by the Architect, a reduction to a lump sum amount less than the five percent (5%) retainage may be approved by the Owner when deemed reasonable. The minimum lump sum retainage shall be twice the estimated cost to correct deficient or incomplete work.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 FINAL PAYMENT
§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Section 12.2.2 of AIA Document A201–2007 — KDE Version, and to satisfy other requirements, if any, which extend beyond final payment;
.2 a final Certificate for Payment has been issued by the Architect; and
.3 the Contractor provides the Owner with affidavits that all payrolls, bills for materials, supplies and equipment, and other indebtedness connected with the Work have been paid or otherwise satisfied, and with Consent of Surety for final payment.

ARTICLE 6 DISPUTE RESOLUTION
§ 6.1 INITIAL DECISION MAKER
The Architect will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A201–2007 — KDE Version, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 BINDING DISPUTE RESOLUTION

For any Claim subject to, but not resolved by, mediation pursuant to Section 15.3 of AIA Document A201–2007 — KDE Version, the method of binding dispute resolution shall be as follows:
(Check the appropriate box. If the Owner and Contractor do not select a method of binding dispute resolution below, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.)

☐ Arbitration pursuant to Section 15.4 of AIA Document A201–2007 — KDE Version

☐ Litigation in a court of competent jurisdiction where the Project is located

☐ Other: *(Specify)*

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2007 — KDE Version.

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2007 — KDE Version.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2007 — KDE Version or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 Payments due and unpaid under the Contract shall bear interest from the date payment is due at such rate required by state law, or in the absence of law, at the legal rate prevailing at the time and place where the Project is located.
(Insert rate of interest agreed upon, if any.)

§ 8.3 The Owner's representative:
(Name, address and other information)

§ 8.4 The Contractor's representative:
(Name, address and other information)

§ 8.5 Neither the Owner's nor the Contractor's representative shall be changed without ten days written notice to the other party.

§ 8.6 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 9.1.1 The Agreement is this executed AIA Document A101–2007, Standard Form of Agreement Between Owner and Contractor — KDE Version.

§ 9.1.2 The General Conditions are AIA Document A201–2007, General Conditions of the Contract for Construction — KDE Version.

§ 9.1.3 The Supplementary and other Conditions of the Contract:
(Either list Supplementary and other Conditions of the Contract here or refer to an exhibit attached to this Agreement.)

Document	Title	Date	Pages

§ 9.1.4 The Specifications:
(Either list the Specifications here or refer to an exhibit attached to this Agreement.)

Section	Title	Date	Pages

§ 9.1.5 The Drawings:
(Either list the Drawings here or refer to an exhibit attached to this Agreement.)

Number	Title	Date

§ 9.1.6 The Addenda, if any:
(Either list the Addenda here or refer to an exhibit attached to this Agreement.)

Number	Date	Pages

Portions of Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are also enumerated in this Article 9.

§ 9.1.7 Additional documents, if any, forming part of the Contract Documents:

.1 AIA Document E201™–2007, Digital Data Protocol Exhibit, if completed by the parties, or the following

.2 Other documents, if any, listed below:

(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201–2007 — KDE Version provides that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor's bid are not part of the Contract Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)

A. AIA Document A701–1997, Instructions to Bidders — KDE Version

B. Contractor's Form of Proposal

C. KDE Purchase Order Summary Form

ARTICLE 10 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A201–2007 – KDE Version.

(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A201–2007 – KDE Version. Either list insurance and bond information here or refer to an exhibit attached to this Agreement.)

Type of Insurance or Bond	Limit of Liability or Bond Amount ($0.00)

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	CONTRACTOR *(Signature)*
(Printed name and title)	*(Printed name and title)*

Kentucky Department of Education

FACPAC PURCHASE ORDER FORM & Instructions

1. FACPAC Purchase Orders Form is now required by the Kentucky Department of Education for processing of purchase orders.

   The Purchase Order Summary Form may be completed and returned with the contract for a timely review by KDE.

   NOTE: The Purchase Order Summary is not a substitute for FACPAC Purchase Orders, and the Purchase Order Summary is only used as a "placeholder" to allow timely information for review and approval by KDE for the Bond Sale. It is not valid unless signed.

2. For **General Construction** projects: FACPAC Purchase Order will be created by the Architect in the system, printed and provided to the General Contractor for signatures. The General Contractor will return the Purchase Order to Architect for final processing thru FACPAC.

3. For **Construction Management** projects: FACPAC Purchase Order will be created by the Construction Manager for final processing thru FACPAC.

4. FACPAC Purchase Order Form (sample copy attached).

5. KDE Purchase Order Summary Sheet attached. Excel file may be obtained by from KDE website or from Architect. (copy attached)

FACPAC Purchase Order Form

Project:
BG Number:
Status:

District:
Phase: Project Initiation (View Checklist)

Contract:
Type: General Contractor

Proposed

District PO Number
Ky Sales Tax Exempt Number
Date of Order
Specification Section
Material Description / Category
Requested By
Vendor Name
Vendor Address

Vendor Phone
Vendor Email
Bill To
Bill To Address

Ship To
Ship To Address

Attention Of

Contacts

The following project contacts must be notified 48 hours in advance of delivery to jobsite.

Contact Name	Contact Phone

Materials

Furnish the necessary materials to complete the following bid package(s) / specification section(s) in its entirety. All materials shall be in accordance with the requirements of the Contract.

Item Description	Item Number	Quantity	Unit Price	Total
			Purchase Order Total:	$0.00

Authorization

Owner Authorization Date
Vendor Authorization Date

Purchase Order Signature Page

Vendor Date

Owner Date

Terms and Conditions

1. Drawings, catalogs, cut sheets, or samples shall be submitted for approval.
2. All invoices shall be sent to the contractor/subcontractor designated on the purchase order for approval. No invoices shall be sent directly to the Board of Education (Owner) for payment.
3. All invoices shall reference the purchase order number.
4. No change in, modification of, or revision of this order shall be valid unless in writing and signed by the Owner.
5. Vendor agrees to observe and comply with all applicable federal, state and locals laws, rules, ordinances and regulations in performance of this order.
6. Vendor shall not assign this order or any right hereunder without first having obtained the written consent of the Owner.
7. Deliveries are to be made in accordance with the Owner's schedule, as directed by the General Contractor (GC), Construction Manager (CM) or Qualified Provider (QP).
8. The Owner may cancel this purchase order in whole or in part in the event that the vendor fails or refuses to deliver any of the items purchased, within the time provided, or otherwise violates any of the conditions of this purchase order, or if it becomes evident that the vendor is not providing materials in accordance with the specifications or with such diligence as to permit delivery on or before the delivery date.
9. The vendor agrees to deliver the items to the supplied hereunder free and clear of all liens, encumbrances and claims.
10. If any of the goods covered under this purchase order are found to be defective in material or workmanship, or otherwise not in conformity with the requirements of this order, the Owner, in addition to the other rights which it may have under warranty or otherwise, shall have the right to reject the same or require that such articles or materials be corrected or replaced promptly with satisfactory materials or workmanship.
11. By acknowledging receipt of this order, by performing the designated work or any portion thereof, or by shipping the designated goods, the vendor agrees to the terms and conditions outlined.
12. This purchase order shall be governed in all respects by the laws of the Commonwealth of Kentucky.
13. In the event the quantities of materials supplied via this purchase order are insufficient to complete the work, the GC, CM or QP shall, at no expense to the Owner, provide such materials as necessary to complete the work.
14. In the event that at the completion of the work the vendor has not submitted invoices totaling the value of this purchase order, this purchase order shall be considered complete and closed.

Kentucky Department of Education
702 KAR 4:160

Purchase Order Summary Form

BG# ______ **Date Submitted** ______

District Code ______ **District Name** ______

School Code ______ **Facility Name** ______

Delivery Method

☐ GC ☐ GESC
☐ CM

PO Certification Statement Phase

☐ Initial Statement ☐ Final Statement
☐ Change Order Stmt.

Contractor Name	PO Number	Bid. Pack. #	Specification Section No.	Purchase Order Description	Vendor Name	Initial PO Amount	Change Order Amount To Date	Reason For Change	Final PO Amount
									-
									-
									-
									-
									-
									-
									-
									-
									-
									-
									-
									-
									-
									-
									-
									-
									-
									-
									-
									-
									-
All signatures below are required based upon the appropriate PO certification statement phase. (Initial / Final)					**Initial PO Total**	$ -	$ -	**Final PO Total**	$ -

Initial Certification Statement
To the best of my knowledge, I certify that all materials listed within this document will be purchased in accordance with 103 KAR 26:070 and 702 KAR 4:160.

Owner's Signature Date

General Contractor's / Construction Manager's Sigr Date

Architect's Signature Date

Final Certification Statement
To the best of my knowledge, I certify that all materials listed within this document have been purchased in accordance with 103 KAR 26:070 and 702 KAR 4:160.

Owner's Signature Date

General Contractor's / Construction Manager's Signature Date

Architect's Signature Date

Kentucky Department of Education Version of AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

This version of AIA Document A201–2007 is modified by the Kentucky Department of Education. Publication of this version of AIA Document A201 does not imply the American Institute of Architects' endorsement of any modification by the Kentucky Department of Education. A comparative version of AIA Document A201–2007 showing additions and deletions by the Kentucky Department of Education is available for review on the Kentucky Department of Education Web site.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

TABLE OF ARTICLES

Init.
/

INDEX
(Topics and numbers in bold are section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Owner direct Purchase Orders, Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 Transmission of Data in Digital Form

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Information and Services Required of the Owner

§ 2.2.1 (Not Used)

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for

information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further

warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design

concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment, and, at the discretion of the Owner may be the Owner's representative during the one-year period for correction of Work described in Section 12.2. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications Facilitating Contract Administration

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance

with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design)

proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.1.4 Proposed Change in the Work equal to or exceeding $25,000 additive or deductive, shall be subject to approval by the Kentucky Department of Education prior to execution of the Change Order by the Owner.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit not to exceed fifteen (15%) of the net cost of the change. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and

.5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be

furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage as stipulated in Section 9.3.4.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the

Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.3.4 When Owner direct Purchase Orders are used, retainage that would otherwise be held on materials and equipment shall transfer to the Contractor, and the material suppliers will be paid the full amount of their invoices. The Owner shall retain ten percent (10%) from each Application for Payment, and an amount equal to ten percent (10%) of approved Purchase Order payments, up to fifty percent (50%) completion of the Work, then provided the Work is on schedule and satisfactory, and upon written request of the Contractor together with consent of surety and the recommendation of the Architect, the Owner shall approve a reduction in Retainage to five percent (5%) of the current Contract Sum plus Purchase Orders. No part of the five percent (5%) retainage shall be paid until after Substantial Completion of the Work, as defined in Section 9.8. herein. After Substantial Completion, if reasons for reduction in retainage are certified in writing by the Architect, a reduction to a lump sum amount less than the five percent (5%) retainage may be approved by the Owner when deemed reasonable. The minimum lump sum retainage shall be twice the estimated cost to correct deficient or incomplete work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

.1 defective Work not remedied;
.2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a separate contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents or as required by state law, whichever is more restrictive, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The ability to occupy and utilize the Work or designated portion thereof shall require an

occupancy permit issued by the Kentucky Department of Housing, Building, and Construction and any other agencies that have statutory authority and approval requirements.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

.1 Upon receipt and approval of the final Application for Payment, for each Contract and Purchase Order, if any, the Architect will prepare, and the Architect and Owner shall complete their portion of the Kentucky Department of Education BG-4 Contract Closeout Form – 2013, and forward the board-approved BG-4 form to the Kentucky Department of Education with a copy of the final Certificate for Payment upon the Board authorizing the BG-4 form, accepting the Work, and approving final payment to the Contractor or Material Supplier.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

.1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
.2 failure of the Work to comply with the requirements of the Contract Documents; or
.3 terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

.1 employees on the Work and other persons who may be affected thereby;
.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property
If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials
§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Liability Insurance

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;

.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 Claims for damages insured by usual personal injury liability coverage;

.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;

.7 Claims for bodily injury or property damage arising out of completed operations; and

.8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents. Such insurance shall be no less than the following amounts:

(1)	Public Liability	$200,000.00 one person/maximum each person $500,000.00 one accident/maximum each person
(2)	Property Damage	$200,000.00 one accident/maximum $500,000.00 aggregate

§ 11.1.2.1 The insurance required by Section 11.1.1 shall be written for not less than the following limits, or greater if required by law:

(1) Worker's Compensation:

a.	State	Statutory
b.	Applicable Federal (e.g., Longshoreman's)	Statutory
c.	Employer's Liability	$500,000

(2) Comprehensive or Commercial General Liability (including Premises-Operations; Independent Contractor's Protection; Product Liability and Completed Operations; Broad Form Property Damage);

a.	General Aggregate (except Products-Completed Operations)	$1,000,000
b.	Products-Completed Operations Aggregate	$1,000,000
c.	Personal/Advertising Injury (per person/organization)	$1,000,000
d.	Each Occurrence (Bodily Injury and Property Damage)	$1,000,000
e.	Limit per Person Medical Expense	$10,000

f. Exclusions of Property in Contractors Care, Custody or Control will be eliminated.

g. Property Damage Liability Insurance will provide Coverage for Explosion, Collapse, and Underground Damage.

(3) Contractual Liability:

a.	General Aggregate	$1,000,000
b.	Each Occurrence (Bodily Injury and Property Damage)	$1,000,000

(4) Automobile Liability:

a.	Bodily Injury	$500,000 Each Person $1,000,000 Each Accident
b.	Property Damage	$500,000 Each Accident, or a combined single limit of $1,000,000

(5) Liability coverage for the Owner, the Architect, the Architect's Consultants and others listed in the Supplementary Conditions will be provided (subject to customary exclusions for professional liability), by endorsement as additional insured's on the Contractor's Liability Policy.

(6) Excess Liability Umbrella Form:

a.	General Aggregate	$1,000,000
b.	Each Occurrence	$1,000,000

§ 11.1.2.2 There shall be an endorsement in each of the above policies reading as follows: "It is hereby agreed that in the event of a claim arising under this policy, the company may not deny liability be reason of the insured being a state, county, municipal corporation or governmental agency."

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 Owner's Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 Property Insurance

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or

companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 Boiler and Machinery Insurance
The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 Loss of Use Insurance
The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 Before an exposure to loss may occur, the Owner shall provide the Architect and the Kentucky Department of Education with certificates of insurance coverage required by this Section 11.3.

§ 11.3.7 Waivers of Subrogation
The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 Performance Bond and Payment Bond

§ 11.4.1 Unless otherwise provided, when the Contract Sum exceeds ~~twenty-five thousand dollars ($25,000)~~ one-hundred thousand dollars ($100,000) the Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. A surety company authorized to do business in Kentucky shall execute bonds, and the cost thereof shall be included in the Contract Sum. Unless otherwise provided, the amount of each bond shall be equal to 100% of the Contract Sum plus Purchase Orders, or 100% of the Lump Sum Base Bid plus or minus accepted Alternates, whichever is greater. **(Refer to attached KDE Directions on KDE Version of AIA Doc A201-2007).**

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 Correction of Work

§ 12.2.1 Before or After Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the

Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.1.1 None of the Contract Documents for this project shall be construed against the party preparing documents on the grounds that the party prepared or drafted the document, or any portion thereof.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 Written Notice

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 Rights and Remedies

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 Tests and Inspections

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as required by state law, or in the absence of law, at the legal rate prevailing at the time and place where the Project is located.

§ 13.7 Time Limits on Claims

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any

other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case

may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

.1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 Notice of Claims

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 Continuing Contract Performance

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 Claims for Additional Time

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation, which shall be in accordance with the Construction Industry Mediation Procedures of the American Arbitration Association in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

KDE Directions on
Kentucky Department of Education Version of
AIA Document A201 – 2007 General Conditions of the Contract for Construction
June 3, 2017

Modify **Article 11 INSURANCE AND BONDS, Paragraph 11.4 Performance and Payment Bond, Subparagraph 11.4.1** as follows:

"11.4.1 Unless otherwise provided, when the Contract Sum exceeds one hundred thousand ($100,000) the Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. A surety company authorized to do business in Kentucky shall execute bonds, and the cost thereof shall be included in the Contract Sum. Unless otherwise provided, the amount of each bond shall be equal to 100% of the Contract Sum plus Purchase Orders, or 100% of the Lump Sum Base Bid plus or minus accepted Alternates, whichever is greater."

AIA® Document G706™ – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

CONTRACT FOR:

CONTRACT DATED:

TO OWNER: *(Name and address)*

OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
SURETY: ☐
OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose

Indicate Attachment ☐ Yes ☒ No

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

3. Contractor's Affidavit of Release of Liens (AIA Document G706A).

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

AIA® Document G706A™ – 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☐
	CONTRACT FOR:	ARCHITECT: ☐
		CONTRACTOR: ☐
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	SURETY: ☐
		OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

AIA® Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)*
-

ARCHITECT'S PROJECT NUMBER:

CONTRACT FOR: General Construction

CONTRACT DATED:

TO OWNER: *(Name and address)*

OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
SURETY: ☐
OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

AIA® Document G707A™ – 1994

Consent of Surety to Reduction in or Partial Release of Retainage

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☐
-	**CONTRACT FOR:**	ARCHITECT: ☐
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	CONTRACTOR: ☐
		SURETY: ☐
		OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves the reduction in or partial release of retainage to the Contractor as follows:

The Surety agrees that such reduction in or partial release of retainage to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

AIA® Document G716™ – 2004

Request for Information ("RFI")

TO: **FROM:**

PROJECT: **ISSUE DATE:** **RFI No.**

REQUESTED REPLY DATE:

PROJECT NUMBERS: / **COPIES TO:**

RFI DESCRIPTION: *(Fully describe the question or type of information requested.)*

REFERENCES/ATTACHMENTS: *(List specific documents researched when seeking the information requested.)*
SPECIFICATIONS: **DRAWINGS:** **OTHER:**

SENDER'S RECOMMENDATION: *(If RFI concerns a site or construction condition, the sender may provide a recommended solution, including cost and/or schedule considerations.)*

RECEIVER'S REPLY: *(Provide answer to RFI, including cost and/or schedule considerations.)*

BY **DATE** **COPIES TO**

Note: This reply is not an authorization to proceed with work involving additional cost, time or both. If any reply requires a change to the Contract Documents, a Change Order, Construction Change Directive or a Minor Change in the work must be executed in accordance with the Contract Documents.

AIA® Document G810™ – 2001

Transmittal Letter

PROJECT: *(Name and address)*
-

TO: *(Name and address)*

FROM: *(Name and address)*

WE TRANSMIT:
VIA:
- ☐ Attached
- ☐ Overnight delivery
- ☐ Courier
- ☐ Under separate cover
- ☐ Mail
- ☐ Fax
- ☐ E-mail
- ☐ Other

FOR:
- ☐ Approval / Action
- ☐ Comment
- ☐ Information
- ☐ Distribution
- ☐ Use as requested
- ☐ Other

THE FOLLOWING:
- ☐ Drawings
- ☐ Submittals
- ☐ Specifications
- ☐ Other
- ☐ Digital Files

NO. OF COPIES	DATE	FORMAT	DESCRIPTION

REMARKS:

BY:

COPIES TO:

SECTION 006100 – SUPPLEMENTARY CONDITIONS

PART 1 - Supplementary Conditions

1.1 SUPPLEMENTARY CONDITIONS

A. Supplementary Conditions for Project consist of the following:

1. AIA Document A201, "General Conditions of the Contract for Construction," (KDE Version) a copy of which is bound in this Project Manual.
2. The following Supplementary Conditions that modify and add to the requirements of the General Conditions of the Contract.

1.2 SUPPLEMENTARY CONDITIONS, GENERAL

A. The following Supplementary Conditions modify or add to the AIA Document A201-2007 General Conditions of the Contract for Construction (KDE Version). Where any Article of the Conditions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these supplements, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.

1.3 ARTICLE 3 - CONTRACTOR

A. Add Sections 3.2.5 and 3.5.6.

1. 3.2.5 - Plans and specifications for this project show or specify various structural, architectural, mechanical and electrical entities, diagrams and devices for each item. The mention of acceptable manufacturer does not necessarily imply that their particular "standard" product meets all of the requirements of the detail or specifications. Therefore, the cost of deviations, extensions or adjustments required for the low Bidder's product must be included in the General Contractor's bid. No additional cost will be considered.

2. 3.2.6 - The Contract Documents are complementary and what is called for in one shall be as binding as if called for by all.

   By execution of this Contract, the Contractor warrants that he has visited the site of the proposed work, and fully acquainted himself with the conditions there existing relating to construction and labor and that he fully understands the facilities, difficulties, and restrictions attending the execution of the work under contract. The Contractor further warrants that he has thoroughly examined and is familiar with the drawings, specifications and all other documents comprising the contract. The Contractor further warrants that by execution of this contract, his failure, when he was bidding on this contract, to receive or examine any form, instrument, or document or to visit the site and acquaint himself with conditions there existing, in no way relieves the Contractor agrees that the Owner shall be justified in rejecting any claim based on facts regarding conditions for which he should have been on prior notice.

   Before ordering material or performing any work, the Contractor shall verify all measurements at the work site. Any difference between dimensions on the Drawings and actual

measurements shall be brought to the Architect's attention for his consideration before the work may proceed. No extra compensation will be allowed because of difference between actual measurements and dimensions indicated on the Drawings. The Contractor shall assume full responsibility for accuracy of measurements obtained at the Work Site.

Dimensions which are lacking shall be obtained from the Architect. In no case shall drawings be scaled.

1.4 ARTICLE 3 – LABOR AND MATERIALS

A. Add Section 3.4.4:

1. 3.4.4 - Where the salvage of materials is indicated on the drawings and specifications, all such materials shall be carefully removed and stored as directed by the Owner/Architect.

B. Add Section 3.5.1:

1. 3.5.1 - The contractor shall also provide warranties as required by the technical specifications.

C. Add Section 3.6.1:

1. 3.6.1 - Contractor is to exclude sales tax for this project on materials as listed on the Form of Proposal Material Breakout List. The Owner shall provide Owner's tax exemption certificate and Owner's purchase orders for direct payment to material vendor for the items listed on the material Breakout List. Contractor may choose to include sales tax on materials considered minor in nature and or material to be directly purchased by the Contractor in lieu of purchase orders paid by the Owner.

D. Add the Sections 3.7.6 and 3.7.7:

1. 3.7.6 - All branches of the work shown on the plans or specified shall be executed in strict compliance with all local or state regulations and codes, and shall be in compliance with all National Codes, when same have jurisdiction.

2. 3.7.7 - All Contractors must be qualified, and meet all requirements provided and/or required under any local and/or state statute, code, ordinances, or rule, governing the performance of the type of work of which he submits a bid, and be able to submit proof thereof upon request3.4 - Addenda:

1.5 ARTICLE 5 - SUBCONTRACTORS

A. Add Section 5.3.1:

1. 5.3.1 - All subcontractors shall familiarize themselves with all of the conditions relating to this contract since the terms set forth in the General Conditions binds all subcontractors to the Contract.

1.6 ARTICLE 7 – CHANGES IN WORK

A. Add Section 7.2.2:

1. 7.2.2 - The Contractor's proposals for work to be covered by a change order shall contain a detailed breakdown of all costs. Separate amounts shall be shown for each material item labor and profit.

1.7 ARTICLE 8 - TIME

A. Add Sections 8.2.4, 8.2.5 and 8.2.6:

1. 8.2.4 - The date of substantial completion shall be as noted below:

a. **November 30, 2024**

2. 8.2.5 - Should the Contractor fail to complete the work under this Contract on or before the date stipulated for Substantial Completion or such later date as may result from extensions in the Contract time granted by the Owner, he agrees that the Owner is entitled to and shall pay the Owner as liquidated damages, the sum of **$500.00** for each consecutive calendar day until such time as Substantial Completion is provided and accepted by the Owner.

3. 8.2.6- The date of Final Completion shall be as noted below:

a. **December 31, 2024**

4. 8.2.7 - Should the Contractor fail to "Final Complete" the project on or before the date stipulated for Final Completion, he agrees that the Owner is entitled to, and shall pay the Owner, as liquidated damages, the sum of **$500.00** for each consecutive calendar day until such time as Final Completion is provided and accepted by the Owner.

1.8 ARTICLE 9 – PAYMENTS AND COMPLETION

A. Add Section 9.3.1.3

1. 9.3.1.3 - The date for each progress payment shall be established to provide sufficient time for the architect's review and for the owner to include the application payment in the agenda of the next regularly scheduled board meeting.

B. Add Section 9.3.5 and 9.3.6

1. 9.3.5 - The Owner and the contractor each binds himself, his partners, successors, assigns and legal representative of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract or sublet it as a whole without written consent of the other, nor shall the Contractor assign any monies due or to become due to him hereunder, without the previous written consent of the Owner.

2. 9.3.6 - Retainage amount as stipulated in KDE Amendment AIA 201 – 2007 Subparagraph 9.3.4 shall be applied to Contractor’s Application for Payment and shall include retainage for material invoices for direct purchased materials. Retainage shall be retained from Contractor’s Pay Application and not retained on invoiced materials. Retainage for invoiced materials shall be held from Contractor’s Pay Application.

C. Add to the front of Section 9.10.1 the following:

1. 9.10.1 - Final completion of the work shall mean when all "punch list" items are completed, when "waiver of lien" is submitted, the manufacturers' warranties are submitted and the contractor has delivered to the Architect all required certificates of inspection. Final Completion shall include final clean-up of the building and premises.

1.9 ARTICLE 10 – PROTECTION OF PERSONS AND PROPERTY

A. Add Sections 10.2.9, 10.2.9.1, 10.2.9.2, 10.2.9.3, 10.2.9.4, and 10.2.9.5

1. 10.2.9 - "CONSTRUCTION AND SAFETY DEVICES: The Contractor shall provide safety controls for protection of the life and health of employees. He will utilize precautionary methods for the prevention of damage to property, materials, equipment and supplies, and for avoidance of work interruptions in the performance of this contract. In order to provide such safety controls aforesaid, the Contractor shall comply with all pertinent provisions of the Kentucky Safety Standards of the Division of the Occupational Safety Standards of the Division of Occupational Safety, Department of Labor and Federal Occupational Safety and Health Construction Standards (OSHA), that are in effect at the time of this contract is entered into and during the period in which the contract is to be performed. Contractor shall also take or cause to be taken such additional measures as the Division of Occupational Safety may determine to be reasonable necessary for the purpose.

a. 10.2.9.1 - The Contractor shall maintain an accurate account of and shall report to the Division of Occupational Safety in the manner and on the forms prescribed by the Division, exposure date and all accidents resulting in death, traumatic injury, occupational disease, and/or damage to property, materials, supplies and equipment incident to work performed under this Contract.

The Division of Occupational Safety will notify the Contractor through the Owner of any non-compliance with the foregoing provisions and the action to be taken. The Contractor shall, after receipt of such notice, immediately correct conditions. Such notice when delivered to the Contractor or his representative at the site of work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until unsatisfactory or corrective action has been taken. Failure or refusal to comply with the order will be grounds for stopping all payments due under the contract of the Contractor. No part of the time lost due to any such stop order shall be made the subject of claim or extension of the time or for excess cost or damages to the Contractor.

Compliance with the provisions of the foregoing sections by subcontractors will be the responsibility of the prime contractor.

Nothing in the aforesaid provisions shall prohibit the U.S. Department of occupational Safety and Health, from enforcing pertinent occupational safety and health standards as authorized under Federal or State Occupational Safety and Health Law.

In any emergency affecting the safety of persons or property, the Contractor shall act, at his discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in Article 7 "Changes in Work".

1.10 ARTICLE – 11 INSURANCE AND BONDS

A. Add Sections 11.4.3, 11.4.4 and 11.4.5

1. 11.4.3 - Contractor shall also furnish such other bonds as are required by the Supplementary Conditions. All Bonds shall be in the forms prescribed by the bidding documents or Supplementary Conditions and be executed by such sureties as are

named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of the authority to act. The Surety shall be acceptable to the Owner. All Bonds shall remain in effect at least until one year after the date of final payment, except as otherwise provided by law.

2. 11.4.4 - If the surety on any Bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in the state of the point of delivery or the surety ceases to meet the requirements stated in the above paragraph, Contractor shall within five days thereafter substitute another Bond and surety, both of which must be acceptable to Owner at no additional cost to Owner.

3. 11.4.5 - Performance & Payment Bond amounts are to include both contract sum and purchase order amounts as included in bid sum.

1.11 ARTICLE 13 – MISCELLANEOUS PROVISIONS

A. Add Section 13.5.7

1. 13.5.7 - Testing of materials and systems shall be as specified in their particular sections of the technical specifications.

B. Add Section 13.9 – Non-Discrimination

1. 13.9 - The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, creed, color or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, emotion or transfer; recruitment of recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this non-discrimination clause.

a. 13.9.1 - The Contractor will, in all solicitations or advertisement for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, or national origin.

b. 13.9.2 - The Contractor will send each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency sanctions for non-compliance.

C. Add Section 13.10 – Affidavit of Assurances

1. 13.10 - Prior to execution of the Contract, the Owner will require of the Contractor a completed and notarized AFFIDAVIT OF ASSURANCES PURSUANT TO KRS 198B.060(10). A copy of the affidavit for DOH-BCE-04, dated 7/90, is attached at the end of the Supplemental Conditions.

D. Add to the end of Section 15.1.5.2 the following:

1. The reference to "adverse weather" shall be clarified to mean weather conditions which are in excess of the 20 year norm as recorded by the National Oceanographic Association."

END OF SECTION 006100

SECTION 006200 – SPECIAL CONDITIONS

SPECIAL CONDITIONS

INDEX TO SPECIAL CONDITIONS:

1. DEFINITIONS:

1a. The term "OWNER" as used throughout these documents means the: **Hart County Board of Education.**

1b. The term "ARCHITECT" as used throughout these documents means Sherman Carter Barnhart Architects, PLLC, 144 Turner Commons Way, Suite 110, Lexington, Kentucky 40508, (859) 224-1351, **c/o Jennifer Cash, AIA.**

1d. The terms "PLANS" and "DRAWINGS" are used interchangeably and are construed to have the same meaning.

2. GENERAL:

2a. These specifications and drawings accompanying them describe the work to be done and the materials to be furnished for the Taylor County Career Technology Center**.**

2b. Should any error or inconsistency appear in the Drawings or Specifications, the Contractor, before proceeding with the work, must make mention of the same to the Architect for proper adjustment and in no case proceed with the work in uncertainty or with insufficient drawings.

2c. The work under this contract does not include any items marked N.I.C. on the drawings (not in contract).

2d. Contractors shall follow sizes in specifications or figures on drawings, in preference to scale measurements and follow detail drawings in preference to general drawings.

2e. Where it is obvious that a drawing illustrates only a part of a given work or of a number of items, the remainder shall be deemed repetitious and so constructed.

3. ARCHITECT'S WORK PRODUCT:

3a. The Architect's work product is prepared and produced for the sole and exclusive benefit of the Owner. Any real or inferred benefits to third parties is hereby expressly disclaimed.

4. ADMINISTRATION OF THE CONTRACT:

4a. The Architect will perform certain administrative functions of the construction contract. Nothing contained in these contract documents, not any other oral or written agreements, memoranda, or communications shall create any express or implied contractual relationship between the Architect and the Contractor.

4b. The Architect may make periodic visits to the work site in accordance with the conditions of his contract with the Owner. The purpose of these visits and observations is to endeavor to guard against defects and deficiencies, not to supervise the Contractor's work.

4c. The Architect makes no express or implied representations of guaranteeing the Contractor's work.

4d. The Architect is not a specialist in construction methods, techniques, sequences or procedures and therefore assumes no responsibility for the construction operations and safety program.

5. CONFLICTS:

5a. If there is any conflict in the General Conditions with the Special Conditions, the Special Conditions shall govern.

6. WORKMANSHIP:

6a. The Workmanship shall be of the highest quality, in every respect, as usually recognized in the building industry. Poor or inferior workmanship (as determined by the Architect, Engineers, or inspecting authorities) is to be removed and replaced to conform to the highest quality standards of the trades concerned, or otherwise corrected.

7. DRAWINGS AND SPECIFICATIONS:

7a. The drawing dimensions shall have precedence over scaled measurements and details over general drawings. In case of conflicts between Drawings and Specifications, the more stringent shall apply.

7b. Figured dimensions on the drawings are reasonably accurate and should govern in setting out the work. However, should the Contractor discover discrepancies or inaccuracies, it shall be the Contractor's responsibility to bring them to the attention of the Architect before making any changes. Changes shall be made only with the approval of the Architect.

8. DIVISION OF SPECIFICATIONS:

8a. Division of Specifications into sections is done for convenience of reference and is not intended to control contractors in dividing work among subcontractors or to limit scope of work performed by any trade under any given section.

9. ALLOCATION OF WORK:

9a. Where certain materials are specified to be installed under various headings, it shall be the responsibility of the General Contractor to re-allocate such work under the proper subcontractor if the specification is in conflict with local jurisdiction.

10. NOTICE AND SERVICE THEREOF:

10a. Any notice to any Contractor from the Owner relative to any part of this contract shall be in writing and considered delivered and the service thereof completed, when said notice is posted, by registered mail, to the said Contractor at his last address, or delivered in person to said Contractor or his authorized representative on the work.

11. CODES AND ORDINANCES:

11a. All branches of the work shown on the plans or specified, whether specifically mentioned or not, shall be executed in strict compliance with all local or state regulations and codes, and shall be in compliance with all National Codes, when same have jurisdiction.

12. SUBSTANTIAL COMPLETION, FINAL COMPLETION & SUBSEQUENT REVIEWS:

12a. In as much as all parties with and intend to prosecute the work in a diligent and good faith manner, and to complete the work in a timely fashion, the Contractor shall notify the Architect when the Contractor believes he has attained Substantial Completion. Notification shall be made at least five (5) calendar days prior to the date set to the Substantial Completion review. The Contractor shall comply with the prerequisite requirements for Substantial Completion as set forth in Section 017700 – Closeout Procedures.

12b. Review Procedures. Upon receipt of the Contractor's request, the Architect will either proceed with review or advise Contractor of prerequisites not fulfilled. Following initial review, the Architect will either prepare a certificate of substantial completion, or advise the Contractor of work which must be performed prior to issuance of the certificate of substantial completion.

The Architect will repeat the review when requested and assured by the Contractor, in writing, that the Work has been substantially completed. Results of the completed review will form the initial "punch list" for final acceptance.

12c. The Architect will review the work upon the receipt of the Contractor's notice that he believes in good faith that, except for those items whose completion has been delayed due to circumstances that are acceptable to the Architect, the work has been completed, including punch list items from earlier reviews. Upon completion of review, the Architect will either recommend final acceptance and final payment, or will advise the Contractor of work not completed or obligations not fulfilled as required for final acceptance by issuance of another punch list.

12d. The Contractor, upon completion of all outstanding items set forth on the punch list, shall notify the Architect of the completion of the work. The Architect shall verify completion of the work by an on-site review.

12e. In the event that the work should still require further reviews after initial post final review, unless through no fault of the Contractor, the Contractor shall authorize the Owner to deduct from the remaining available construction funds those monies which represent the Architect's normal hourly compensation rates and normal expenses for any additional time and expense expended on this project by the Architect. Hourly rates and expense reimbursement rates will be governed by those rates stipulated in the agreement between the Owner and the Architect. The disbursement of available construction funds by the Owner to the Architect in the aforegoing situation, described herein, shall represent only actual charges associated with the expenditure of the Architect's time and expense and in no way represent a penalty assessed to the Contractor.

13. STORAGE OF MATERIALS:

13a. Each Contractor providing materials and equipment shall be responsible for the proper and adequate storage of his materials and equipment, and for the removal of same upon completion of his work. Storage of materials at the site shall be confined to areas within the Contract Limits, and the Contractor's designated parking area if necessary, where designated by the Architect.

14. LAYOUT:

14a. The General Contractor shall lay out the work and be responsible for all lines, levels and measurements of all work executed under this Contract; he shall verify the figures before laying out the work and will be held responsible for any error resulting from his failure to do so.

14b. The General Contractor shall be prepared to guarantee each of his subcontractors the dimensions which they may require for the layout and fitting of their work to the surrounding work.

15. DAMAGED FACILITIES:

15a. The General Contractor shall repair and/or replace, at no expense to the Owner, any sections of existing roads, drives, streets, sidewalks, curbs, utilities, buildings and other structures damaged by reason of work performed under this Contract or incidental thereto, whether by his own forces or by his subcontractors or by his material suppliers.

16. UNIT PRICES:

16a. The Unit Price for each of the items set forth in the Form of Proposal shall become a part of the Contract.

16b. All Unit Prices are subject to review by the Owner and Architect prior to being accepted for contract purposes.

16c. All subcontractors shall be bound by the Unit Prices of the General Contractor.

16d. It is mutually understood and agreed that such Unit Prices include all items of cost, overhead and profit for the Contractor and any subcontractor(s) involved, and that they shall be used uniformly without modification for either additions or deductions.

16e. The Rules of Measurement, as specified in Paragraph 17 of this Section, shall apply in the use of Unit Prices.

16e1. Each Unit Price involving earthwork shall cover, among other things, engineering (surveying) costs and all costs of keeping excavations dry.

17. RULES OF MEASUREMENT:

17a. The following Rules of Measurement shall apply in the use of Unit Prices:

17a1. Except as provision is made hereinafter for arbitrary measurements, the quantity of excavation shall be its in-place volume before removal.

17a2. No allowance will be made for excavating additional material of any nature taken out for the convenience of the Contractor, beyond the quantity computed under these Rules of Measurement.

17a3. The quantities of excavation shall be computed from instrument readings in vertical cross sections located at such intervals as will assure accuracy.

17a4. General excavation for buildings and sections of buildings, bases for equipment, sump pits, etc., involving an area of 200 or more square feet, shall be classified as "Mass Excavation".

17a5. Excavation for pipes, wall footings, grade beams, column footings, and sections of buildings such as bases for equipment, sump pits, etc., involving an area of 200 square feet, shall be classified as "Mass Excavation".

17a6. "Mass Excavation" shall arbitrarily be assumed to extend to vertical planes two (2) feet outside wall lines, and to the elevation of plan subgrade.

17a7. "Trench Excavation" for walls, grade beams, and sections of building, such as bases for equipment, sump pits, etc., involving an area less than 200 square feet shall be arbitrarily assumed to extend 2 feet wider than wall and grade beam thicknesses and outside walls of sections of buildings such as bases for equipment, sump pit, etc., but in no case less than three (3) feet wide sides vertical.

17a8. "Trench Excavation" for pipes shall arbitrarily be assumed to be two (2) feet wider than the outside diameter of the pipe barrel and with sides vertical.

17a9. "Trench Excavation" for wall footings and column footings shall be computed as vertical shafts, each with a horizontal cross section identical in shape and size with the plan of the footing.

17a10. The quantities of form work will be the area of forms in contact with concrete.

17a11. Concrete quantities shall be computed from plan size or if there are no drawings, from actual measurement of the work ordered and placed, waste excluded.

18. INTERRUPTION OF UTILITIES:

18a. Utility services to existing facilities shall not be interrupted unless absolutely necessary. Interruptions shall be of minimum duration and shall be scheduled to cause the least possible

inconvenience. In all cases, the Owner shall be notified well in advance of an anticipated interruption of utilities.

19. CONTRACTOR COORDINATION:

19a. The General Contractor and all subcontractors and other on-site contractors shall cooperate and coordinate their work to expedite the progress of the project. All subcontractors shall review and refer to the drawings and specifications of other trades involved with their particular work before proceeding. Any work installed which conflicts with another trade and had not been brought to the attention of the Architect prior to installation shall be removed at no additional expense to the Owner.

END OF SECTION 006200

SECTION 011000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Type of the Contract.
3. Use of premises.
4. Owner's occupancy requirements.
5. Work restrictions.
6. Specification formats and conventions.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Notice to Contractor(s): Qualified Contractor(s) are invited to submit sealed bids for Project as described in this Document according to the Instructions for Contractors.

B. Project Identification: Legrande Elementary School Addition and Renovation

1. Project Number: SCB #2210 / BG #23-277

Project Location: 70 Legrande School Road, Horse Cave, Kentucky 42749

2. The successful contractor must provide a payment and performance bond on the project.

C. Owner: Hart County Board of Education, 25 Quality Street, Munfordville, KY 42765

D. Project Description: The addition of new kitchen and cafeteria and the renovation of existing gang restrooms and administration suite. Also, the existing kitchen and cafeteria are to be renovated into classrooms, nursing, guidance and resource offices.

1.4 TYPE OF CONTRACT

A. Project will be carried out under a single prime contract.

1.5 USE OF PREMISES

A. Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.

B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of project site beyond areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy of Project site.
2. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

    a. Schedule deliveries to minimize use of driveways and entrances.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Parking: Park in designated areas only.

D. Deliveries: Provide representative to receive all materials and offload at the job site. The Owner will refuse all deliveries to other locations.

E. Personnel Identification: All construction personnel on the facility must wear Owner-furnished identification badges at all times. Personnel without proper identification are subject to removal from the site by the Owner.

F. Safety and Security: Comply with Owner’s requirements related to security and fire drills and alerts.

G. Heating Operations: Comply with Owner’s requirements related to Burning and Welding permits. Coordinate turning off fire/smoke detection systems in affected areas. Contractor shall be responsible for Fire Department response fees related to construction operations.

H. Smoking: No smoking is allowed on the premises.

I. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner’s neighboring usage. Perform the Work so as not to interfere with Owner's day-to-day operations.

    1. Maintain access roads and parking areas as coordinated with the district for student and bus operations throughout the day.
    2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:

1. Unit-cost allowances.
2. Quantity allowances.

C. Related Requirements:

1. Section 012200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.
2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.3 DEFINITIONS

A. Allowance is a quantity of work or dollar amount established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.4 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.5 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.6 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 UNIT-COST ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include freight and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 QUANTITY ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.9 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.

2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Soft Soil Allowances: Include an allowance based on the following work scope: The contractor shall include in the base bid, an allowance to remove and dispose off-site an additional 150 cy of unsuitable soil, which may be encountered below plan bottom depth. The allowance price shall include replacement with 150 cy of DGA placed and compacted in accordance with the project geotechnical report and on-site testing agency recommendations. Actual volumes in the allowance shall be measured by the on-site testing agency and the contract will be adjusted using unit prices.

B. Allowance No. 2: The contractor shall include in the base bid an allowance of $1,000 per 1,000 face brick for work identified within the Construction Documents. The allowance sum includes tax, handling, shipping and any other costs. Installation and all necessary installation accessories are base bid.

END OF SECTION 012100

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Requirements:

1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
2. Section 014000 "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

B. The listing of unit prices shall **NOT** be construed to mean that the listed work may be omitted from the Contractor’s bid. The unit prices are requested in the event of a change in project scope subsequent to execution of the construction contract.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

1. Alternate No. 01: Cafeteria flooring to be premium vinyl tile and base (not terrazzo).
2. Alternate No. 02: Provide Owner-preferred Sloan auto-flush valves.
3. Alternate No. 03: Provide Owner-preferred Best Locks for door hardware.

End of Section 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENT

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions made during construction.

B. Related Requirements:
1. Section 012100 "Allowances" for products selected under an allowance.
2. Section 012300 "Alternates" for products selected under an alternate.
3. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1.4 ACTION SUBMITTALS

A. Substitution Request Form: Use form provided at the end of Section 002600.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.

h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from Kentucky Department of Housing, Building and Construction.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
   a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
   b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitution of products will be reviewed. Requests for substitutions must be submitted to the Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
   a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   b. Substitution request is fully documented and properly submitted.

c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

End of Section 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Division 1 Section "Unit Prices" for administrative requirements for using unit prices.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time as required.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal requests issued by the architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within 7 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated schedule that indicates the effect of the change.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
   2. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   3. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

   1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

      a. Application for Payment forms with continuation sheets.
      b. Submittal schedule.
      c. Items required to be indicated as separate activities in Contractor's construction schedule.

   2. Submit the schedule of values to Architect at earliest possible date, but no later than 21 days before the date scheduled for submittal of initial Applications for Payment.
   3. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Name of Architect.
    c. Contractor's name and address.
    d. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Total completed and stored to date of application
    h. Previous Applications
    i. Percentage of Completion
    j. Balance to Finish
    k. Retainage

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

11. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Schedule of unit prices.
6. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
7. Certificates of insurance and insurance policies.
8. Performance and payment bonds.
9. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Requests for Information (RFIs).
   3. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:
   1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, and telephone number of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different sections that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule.
   2. Preparation of the schedule of values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Pre-installation conferences.
   7. Project closeout activities.
   8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
   1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. Project name.
   2. Project number.
   3. Date.
   4. Name of Contractor.
   5. Name of Architect.
   6. RFI number, numbered sequentially.

7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.
2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Include the following:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Critical work sequencing and long-lead items.
      c. Designation of key personnel and their duties.
      d. Lines of communications.
      e. Procedures for processing field decisions and Change Orders.
      f. Procedures for RFIs.
      g. Procedures for testing and inspecting.
      h. Procedures for processing Applications for Payment.
      i. Submittal procedures.
      j. Preparation of record documents.
      k. Use of the premises.
      l. Owner's occupancy requirements.
      m. Security.
      n. Progress cleaning.
   4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
   1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, and Owner's Commissioning Authority of scheduled meeting dates.
   2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
      a. Submittals.
      b. Possible conflicts.
      c. Compatibility requirements.
      d. Time schedules.
      e. Manufacturer's written instructions.
      f. Acceptability of substrates.
   3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at monthly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
        1) Review schedule for next period.
    b. Review present and future needs of each entity present, including the following:
        1) Status of submittals.
        2) Access.
        3) Temporary facilities and controls.
        4) Progress cleaning.
        5) Quality and work standards.
        6) Field observations.
        7) Status of RFIs.
        8) Status of proposal requests.
        9) Pending changes.
        10) Status of Change Orders.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Site condition reports.
5. Special reports.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.
3. Two paper copies.

B. Startup construction schedule.

1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

F. Construction Schedule Updating Reports: Submit with Applications for Payment.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

H. Special Reports: Submit at time of unusual event.

I. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

C. Coordinate work with other contractors acquired by the Owner as required to maintain the schedule.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
2. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
3. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

5. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
3. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Use of premises restrictions.
    d. Environmental control.

4. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Temporary enclosure and space conditioning.
    b. Permanent space enclosure.
    c. Completion of mechanical installation.
    d. Completion of electrical installation.
    e. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones:

1. Temporary enclosure and space conditioning.

E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.
6. Status of work by contractors acquired by the Owner and any impact to project schedule.

G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.

    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Utility interruptions.
    d. Installation.
    e. Work by Owner that may affect or be affected by Contractor's activities.
    f. Punch list and final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.

   a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
   b. Total cost assigned to activities shall equal the total Contract Sum.

D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.4 REPORTS

A. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:
1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
   2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
   3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
      a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
   4. Format: Arrange the following information in a tabular format:
      a. Scheduled date for first submittal.
      b. Specification Section number and title.
      c. Submittal category: Action; informational.
      d. Name of subcontractor.
      e. Description of the Work covered.
      f. Scheduled date for Architect's final release or approval.
      g. Scheduled date of fabrication.
      h. Scheduled dates for purchasing.
      i. Scheduled dates for installation.
      j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
   4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 business days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
   a. Project name.
   b. Date.
   c. Name and address of Architect.
   d. Name of Contractor.
   e. Name of firm or entity that prepared submittal.
   f. Names of subcontractor, manufacturer, and supplier.
   g. Category and type of submittal.
   h. Submittal purpose and description.
   i. Specification Section number and title.
   j. Specification paragraph number or drawing designation and generic name for each of multiple items.
   k. Drawing number and detail references, as appropriate.
   l. Location(s) where product is to be installed, as appropriate.
   m. Related physical samples submitted directly.
   n. Indication of full or partial submittal.
   o. Transmittal number, numbered consecutively.
   p. Submittal and transmittal distribution record.
   q. Other necessary identification.
   r. Remarks.

E. Options: Identify options requiring selection by Architect.

F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Post electronic submittals as PDF electronic files directly to Architect's FTP site specifically established for Project.
      a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
   2. Submit electronic submittals via email as PDF electronic files.
      a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
   3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
   4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
   5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
      a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
      b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's product specifications.
      b. Standard color charts.
      c. Statement of compliance with specified referenced standards.
      d. Testing by recognized testing agency.
   4. For equipment, include the following in addition to the above, as applicable:
      a. Wiring diagrams showing factory-installed wiring.
   5. Submit Product Data before or concurrent with Samples.
   6. Submit Product Data in the following format:
      a. PDF electronic file.
      b. Three paper copies of Product Data unless otherwise indicated. Architect will return two copies.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Identification of products.
    b. Compliance with specified standards.
    c. Notation of coordination requirements.
    d. Notation of dimensions established by field measurement.
    e. Relationship and attachment to adjoining construction clearly indicated.
    f. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
3. Submit Shop Drawings in the following format:
    a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
    e. Specification paragraph number and generic name of each item.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

F. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

G. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

H. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

I. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

J. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

K. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

B. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

D. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
   1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
   2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
   3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
   1. Project quality-control manager shall not have other Project responsibilities.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
   1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
   2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
   3. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.

12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including

service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect, Commissioning Authority, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
   1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.

2. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
3. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
4. Retesting and reinspecting corrected work.
5. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with a copy to Contractor and to authorities having jurisdiction..

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014100 – SPECIAL INSPECTIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Special inspections as defined in Chapter 17 of the 2018 Kentucky Building Code (KBC) are required.

B. The Inspection Agency shall conduct inspections under the supervision of a qualified professional engineer licensed in the State of Kentucky (Special Inspector).

C. Seismic Design Category for the structure is shown in the General Notes section of the structural drawings.

D. Special inspections are required for the following materials and work:

1. Inspection of Fabricated Items per Section 1704.2.5 of the KBC.
2. Steel Construction per Section 1705.2 of the KBC.
3. Concrete Construction per Section 1705.3 of the KBC.
4. Masonry Construction per Section 1705.4 of the KBC.
5. Wood Construction per Section 1705.5 of the KBC.
6. Soils and Prepared Fill per Section 1705.6 of the KBC.
7. Cast-In-Place Deep Foundations per Section 1705.8 of the KBC.
8. Helical Piles and Micro-Pile Foundations per Section 1705.9 of the KBC.
9. Fabricated Items per Section 1705.10 of the KBC.

1.3 SELECTION AND PAYMENT

A. The Owner will employ and pay for Special Inspection and testing services that are required by the Contract Documents and the Kentucky Building Code. The Inspection Agency will be responsible for providing all Special Inspection (including testing as listed herein). The scope of work may not be broken into separate contracts with multiple firms.

B. The Sub-Contractor shall pay for any additional inspections and / or testing required for their scope of work or materials that do not comply with the Contract Documents due to nonconformance or negligence.

C. Inspection work not part of the Structural Special Inspections may be performed by an Inspection Agency of the Construction Manager's (CM) or Sub-Contractor's (SC) choosing, unless noted otherwise. Where individual Sections specifically indicate that certain inspections, tests and other quality control services are the Sub-Contractor's responsibility, the Sub-Contractor shall employ and pay a qualified independent testing agency to perform quality control services. Costs for these services are to be included in the Sub-Contract Sum.

D. The Sub-Contractor shall pay for any additional testing/inspections required for his convenience.

E. In the case of excessive waste/lost time of the Special Inspector due to inadequate scheduling by the General Contractor or the Sub-Contractor (SC), such time shall be paid for by the CM or SC (as applicable) as an additional service of the Inspection Agency.

1.4 QUALITY ASSURANCE

A. Qualified Certification Authorities: Subject to compliance with Kentucky Building Code Requirements, Qualified Certification Authorities providing certification which may be applicable to Project include:

1. American Concrete Institute (ACI).
2. American Institute of Steel Construction (AISC).
3. American Welding Society (AWS).
4. National Institute of Certified Engineering Technology (NICET).
5. Steel Joist Institute (SJI).
6. Truss Plate Institute (TPI)

B. Each inspector performing work on the Project shall be qualified to perform inspections for the particular type of construction or operation requiring special inspection by a Qualified Certification Authority as defined in the Kentucky Building Code. "Qualification" for purposes of this section shall mean a certified professional where certification in that jurisdiction exists. Subject to compliance with Kentucky Building Code requirements, Qualified Certification Authorities providing certification which may be applicable to Project include, but are not limited to, the following:

1. Steel Construction
   a. Material verifications, bolted connections, visual observation of welds – AWS Level 1.
   b. Steel frame connection details – Professional Engineer licensed in the Commonwealth of Kentucky with experience in the design of building structures.
2. Concrete Construction
   a. Use of Design Mix – ACI Level 2
   b. Material Verification, sampling of fresh concrete – NICET Level 1 (Concrete)
   c. Reinforcing Steel Inspection 0 NICET Level 2 (Concrete)
3. Soils and Rock Bearing Materials
   a. NICET Level 2 (soils).

C. Prior to any construction, Inspection Agency shall submit list of personnel who may provide inspection work on project. List shall include the name and certification level (qualification) of each inspector. List shall also include the name and professional engineering registration number of the Special Inspector and the Professional Engineer with experience in the design of building structures.

D. The Inspection Agency shall carry professional liability insurance for errors and omissions to a minimum limit of $1,000,000 per occurrence and shall submit certificate of insurance along with the qualifications to the Architect and Engineer.

E. Special Inspector Qualifications: A professional engineer who is legally authorized to practice in the State of Kentucky and who is experienced in providing testing and inspection services of structure system types similar to this Project in material, design, and extent.

PART 2 – EXECUTION

2.1 MEETINGS

A. The Special Inspector shall attend any pre-construction meetings which may be conducted at the construction site by the Structural Engineer to discuss quality issues.

B. The Special Inspector shall attend monthly construction progress meetings which will be held at the construction site by the Architect, Engineer, and the Construction Manager

2.2 CONTRACTOR'S RESPONSIBILITIES

A. Coordinate with the Inspection Agency to provide inspection and testing services.

B. Provide a complete copy all structural shop drawing to the Structural Testing/Inspection Agency.

C. Provide a complete copy of ICC Evaluation Service Reports (ESR) for each type of post-installed concrete anchor to be used on this project.

D. Provide a complete copy of the ICC ESR for each type of epoxy adhesive used for post-installed concrete anchors and reinforcing steel to be used on this project.

E. Arrange the preconstruction meeting to discuss quality issues.

F. Notify the Structural Testing/Inspection Agency sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.

G. Cooperate with Structural Testing/Inspection Agency and provide access, including equipment with operator, to work. Access equipment includes, but is not limited to, man lifts, excavation equipment, etc.

H. Provide samples of materials to be tested in required quantities.

I. Provide storage space for Structural Testing/Inspection Agency's exclusive use, such as for storing and curing concrete testing samples. If required by Special Inspector, Contractor shall provide cure box with electricity, water, and blankets for curing concrete specimens.

J. Provide labor to assist the Structural Testing/Inspection Agency in performing tests/inspections. Labor includes, but is not limited to, construction of masonry prisms, etc.

K. Neither the observation of the Architect/Structural Engineer in the administration of the contract, nor tests/inspections by the Testing/Inspection Agency, nor approvals by persons other than the Architect/Structural Engineer shall relieve the Sub-Contractors from their obligation to perform the work in accordance with the Contract Documents.

2.3 SPECIAL INSPECTOR'S RESPONSIBILTIES

A. Cooperate with the Construction Manager (CM) and Sub-Contractor (SC) and provide timely service.

B. Notify Construction Manager (CM) of minimum advance notice for each type of inspection/test.

C. Upon arriving at the construction site, sign in and notify the Construction Manager (CM) of presence.

D. Select the representative samples that are to be tested/inspected.

E. Perform tests/inspections as outlined in Contract Documents, the applicable codes, and as directed by the Structural Engineer.

F. Keep records of all inspections.

G. Furnish inspection reports to the Architect, Structural Engineer, and Construction Manager (CM) weekly as construction progresses.

H. Inform Construction Manager (CM), Sub-Contractor (SC) and / or Fabricator of all discrepancies immediately for correction.

1. Document in writing correction of discrepancies.
2. Highlight discrepancies within the report.
3. If discrepancies are not corrected, the discrepancies shall be brought to the attention of the Code Official and the Structural Engineer prior to the completion of that phase of the work.

I. Leave copies of field notes with the Construction Manager (CM) prior to leaving the construction site. Field notes shall include the message given to the CM, date, time of message, name of CM's representative informed, type and location of work or materials tested/inspected, whether the work or materials complies with Contract Documents and name of the Structural Testing/Inspection Agency's representative.

J. Immediately notify Construction Manager, Architect, and Structural Engineer by separate letter if work yet to be inspected is found on site that is either being covered by other work or was to receive continuous inspection.

K. Structural Testing/Inspection Agency shall not alter requirements of Contract Documents, approve or reject any portion of the work, or perform duties of the Construction Manager (CM) or the Sub-Contractor (SC).

L. Submit a final report of inspections documenting completion of all required Special Inspections and correction of any discrepancies noted in inspections to the Structural Engineer. Final report shall be prepared by, sealed, and signed by the Special Inspector and shall include a complete list of materials and work inspected during the course of the project.

1. Submit one complete set of all special inspection reports to Structural Engineer of Record with final report of special inspections. Report set shall be bound, divided by construction type, and in chronological order.

2.4 INSPECTION OF FABRICATORS

A. Inspect the fabrication of structural load-bearing members where such work is being performed on the premises of the Fabricator’s shop.

1. Fabricators shall be exempt from special inspection when a Qualified Certification Authority (as defined in section 1704.2.5 of The Kentucky Building Code) has periodically reviewed and approved Fabricator’s written procedural and quality control manuals and fabrication practices. Subject to compliance With Kentucky Building Code requirements, Qualified Certification Authorities providing certification which may be applicable to Project include, but are not limited to, the following:

a. Structural Steel Fabricators – AISC or AWS certified.
b. Steel Joist Fabricators – SJI certified.
c. Metal Plate Connected Wood Trusses – TPI certified
d. Reinforcing Steel – ACI certified

2. Fabricators exempt from special inspection shall submit a certificate of compliance to the structural engineer of record at the completion of fabrication

stating that all work was completed in accordance with the approved construction documents.

B. Verify that the Fabricator maintains and review for completeness Fabricator's detailed fabrication and quality control procedures which provide a basis for control of the workmanship and ability to conform to the approved construction documents and reference standards.

C. Perform special inspections at Fabricator's shop as outlined in this specification for each type of construction.

2.5 INSPECTION OF STEEL CONSTRUCTION

A. Provide Special Inspection of the fabrication of structural steel elements and assemblies in accordance with Section 2.4.

B. Verify that certification numbers on bolt, nut, and washer containers correspond to the identification numbers on mill test reports and that manufacturer's symbol and grade markings appear on all bolts and nuts. Also verify that bolts, nuts, and washers are being properly cared for at the site.

C. Verify that identification markings on structural steel members conform to ASTM standards specified on the approved construction documents.

D. Verify that identification markings on weld filler materials conform to ASTM standards specified on the approved construction documents. Also verify that weld filler material is being properly cared for.

E. Test and inspect high-strength bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

1. Perform periodic inspection of bearing type connections.
2. Perform continuous inspection of slip-critical type connections.
3. Verify that direct-tension indicator gaps comply with ASTM F 959, Table 2.
4. Verify that twist-off-type tension-control assemblies have been properly tightened.

F. Inspect and test welds during fabrication (where applicable) and erection of structural steel as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
2. Inspect all weld procedures and welders according to the requirements of AWS D1.1-2000.
3. Use non-destructive testing according to AWS D1.1-2000, Section 6.11, on all welds that appear to have excessive inclusions, porosities, cracks, and incomplete penetrations as described by AWS D1.1-2000, or have the questionable weld removed and rewelded.
4. Perform continuous non-destructive testing according to AWS D1.1-2000, Section 6.11, on all complete penetration and/or partial penetration groove welds and on all splices of main members where those splices are required.
5. Perform continuous inspection according to AWS D1.1-2000, Section 6.9 (visual inspection) on all multi-pass fillet welds and on all single-pass fillet welds larger than 5/16".
6. Perform periodic inspection according to AWS D1.1-2000, Section 6.9 (visual inspection) on all single-pass fillet welds smaller than 5/16" and on all floor, form, and roof deck welds.

G. Inspect all steel frame connection details for compliance with approved construction documents and approved steel erection shop drawings.

1. Verify completeness and construction of all bracing, stiffening, and connections.
2. Verify location, completeness and accuracy of all members.

2.6 INSPECTION OF POST-INSTALLED CONCRETE ANCHORS & REINFORCING STEEL

A. Post-installed concrete anchors shall include expansion anchors, concrete screws and threaded rods set into hardened concrete using an epoxy anchoring system.

B. Post-installed reinforcing steel is rebar set into hardened concrete using an epoxy anchoring system.

C. The Construction Manager shall furnish a copy of the ICC ESR for each type Post-installed anchor and epoxy anchoring system used on this project in accordance with Section 2.2.

D. The Special Inspector shall verify and document that the installation was executed in accordance with the appropriate ICC ESR for the specific product used.

2.7 INSPECTION OF CONCRETE CONSTRUCTION (including ICF walls)

A. Provide special inspection of the fabrication of concrete structural elements and assemblies in accordance with SECTION 2.4.

B. Periodically verify the use of the proper Design Mix.

C. Verify use of proper grade and ASTM designation of reinforcing steels.

D. Perform periodic inspection on placement, spacing, clear cover, number, and splice lap lengths of reinforcing steel.

E. Monitor concrete quality by means of site and laboratory tests. The Inspection Agency is authorized to reject plastic concrete not conforming to specifications. Immediately inform the Construction Manager (CM), the Sub-Contractor (SC), the Architect and the Structural Engineer of inadequacies in concrete quality. Sampling and testing for quality control during concrete placement shall include the following:

1. Sampling Fresh Concrete: ASTM C 172.
   a. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
   b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
   c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
   d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
   e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than

the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.

3. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

4. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

5. Test results will be reported in writing to Architect, Structural Engineer, ready-mix producer, and Construction Manager (CM) within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-
day tests.

F. Perform continuous inspection of concrete placement to verify proper application techniques.

G. Perform periodic inspection of concrete curing procedures to verify maintenance of specified curing temperature, protection, and techniques.

H. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

I. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

2.8 INSPECTION OF MASONRY CONSTRUCTION

A. At onset of masonry construction and periodically thereafter, verify proportions of site-prepared mortar, construction of mortar joints, and location of reinforcement and connectors.

B. Perform periodic inspection to verify size and location of structural elements; type, size, and location of anchors, including anchorage to other structural elements, frames, and construction; and specified size, grade, and type of reinforcement.

C. Prior to each grouting operation, verify cleanliness of grout space, placement of all reinforcement and connectors, including lap splice lengths, and proportions of site-prepared grout.

D. Perform continuous inspection of grout placement, consolidation, and re-consolidation to verify compliance with contract document provisions.

E. Perform periodic inspection of masonry curing procedures to verify maintenance of specified curing temperature, protection, and techniques.

F. Sample and test grout compressive strength according to ASTM C 1019 and the following:

1. Compression Test Sample: one set of three standard cube specimens for each compressive-strength test, unless otherwise directed. Mold and store cubes for laboratory-cured test specimens except when field-cured test specimens are required.
2. Compressive-Strength Tests: one sample for each day's grouting; one specimen tested at 7 days, one specimen tested at 28 days, and one specimen retained in reserve for later testing if required.

2.9 INSPECTION OF SOILS

A. Inspect the existing site soil conditions, fill placement, and load-bearing requirements for compliance with the recommendations of the approved geotechnical investigation report.

1. Where the site is specified to be undercut by the geotechnical investigation report, verify all existing uncontrolled fills have been removed from below applicable foundation elements to the specified depth.

B. Verify and document that Foundation Excavations extend to the proper depth as specified on the Contract Documents and the approved Geotechnical Report.

C. Prior to placement of any engineered fill, determine that the site has been prepared in accordance with the recommendations of the approved Geotechnical Report.

D. During placement and compaction of the engineered fill material, verify that the material being used, maximum lift thickness, and in-place dry density comply with the recommendations of the approved Geotechnical Report.

2.10 CAST-IN-PLACE DEEP FOUNDATIONS

A. Inspect Drilling Operations and maintain complete and accurate records of same.

B. Verify Shaft locations, diameters, plumbness and embedment into rock.

C. Verify Bearing Capacity to comply with Geotechnical Report recommendations.

D. Test Probe Holes to identify any voids, clay seams and/or solution channels. Notify the Architect and Geotechnical Engineer immediately when a discontinuity in the rock is identified.

E. Record Concrete Volumes

F. Test Concrete in accordance with SECTION 2.7.

END OF SECTION 014100

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
10. AF&PA - American Forest & Paper Association; www.afandpa.org.
11. AGA - American Gas Association; www.aga.org.
12. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
14. AI - Asphalt Institute; www.asphaltinstitute.org.
15. AIA - American Institute of Architects (The); www.aia.org.
16. AISC - American Institute of Steel Construction; www.aisc.org.
17. AISI - American Iron and Steel Institute; www.steel.org.
18. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
19. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
20. ANSI - American National Standards Institute; www.ansi.org.
21. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
22. APA - APA - The Engineered Wood Association; www.apawood.org.
23. APA - Architectural Precast Association; www.archprecast.org.
24. API - American Petroleum Institute; www.api.org.
25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
26. ARI - American Refrigeration Institute; (See AHRI).
27. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
28. ASCE - American Society of Civil Engineers; www.asce.org.
29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
31. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
32. ASSE - American Society of Safety Engineers (The); www.asse.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
35. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
36. AWEA - American Wind Energy Association; www.awea.org.
37. AWI - Architectural Woodwork Institute; www.awinet.org.
38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
39. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
40. AWS - American Welding Society; www.aws.org.
41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.

44. BICSI - BICSI, Inc.; www.bicsi.org.
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
46. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47. BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; www.ec-central.org.
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
73. EIA - Electronic Industries Alliance; (See TIA).
74. EIMA - EIFS Industry Members Association; www.eima.com.
75. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
76. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
77. ESTA - Entertainment Services and Technology Association; (See PLASA).
78. EVO - Efficiency Valuation Organization; www.evo-world.org.
79. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
80. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
81. FM Approvals - FM Approvals LLC; www.fmglobal.com.
82. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
83. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
84. FSA - Fluid Sealing Association; www.fluidsealing.com.
85. FSC - Forest Stewardship Council U.S.; www.fscus.org.
86. GA - Gypsum Association; www.gypsum.org.
87. GANA - Glass Association of North America; www.glasswebsite.com.
88. GS - Green Seal; www.greenseal.org.
89. HBC – KY Department of Housing and Building Construction
90. HI - Hydraulic Institute; www.pumps.org.
91. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
92. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
93. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.

94. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
95. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
96. IAS - International Approval Services; (See CSA).
97. ICBO - International Conference of Building Officials; (See ICC).
98. ICC - International Code Council; www.iccsafe.org.
99. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
100. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
101. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
102. IEC - International Electrotechnical Commission; www.iec.ch.
103. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
104. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
105. IESNA - Illuminating Engineering Society of North America; (See IES).
106. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
107. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
108. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
109. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
110. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
111. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
112. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
113. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
114. ISO - International Organization for Standardization; www.iso.org.
115. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
116. ITU - International Telecommunication Union; www.itu.int/home.
117. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
118. KTC - Kentucky Transportation Cabinet
119. KYDOW – Kentucky Division of Water
120. LMA - Laminating Materials Association; (See CPA).
121. LPI - Lightning Protection Institute; www.lightning.org.
122. MBMA - Metal Building Manufacturers Association; www.mbma.com.
123. MCA - Metal Construction Association; www.metalconstruction.org.
124. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
125. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
126. MHIA - Material Handling Industry of America; www.mhia.org.
127. MIA - Marble Institute of America; www.marble-institute.com.
128. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
129. MPI - Master Painters Institute; www.paintinfo.com.
130. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
131. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
132. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
133. NADCA - National Air Duct Cleaners Association; www.nadca.com.
134. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
135. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
136. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
137. NCMA - National Concrete Masonry Association; www.ncma.org.
138. NEBB - National Environmental Balancing Bureau; www.nebb.org.
139. NECA - National Electrical Contractors Association; www.necanet.org.
140. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
141. NEMA - National Electrical Manufacturers Association; www.nema.org.
142. NETA - InterNational Electrical Testing Association; www.netaworld.org.

143. NFHS - National Federation of State High School Associations; www.nfhs.org.
144. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
145. NFPA - NFPA International; (See NFPA).
146. NFRC - National Fenestration Rating Council; www.nfrc.org.
147. NHLA - National Hardwood Lumber Association; www.nhla.com.
148. NLGA - National Lumber Grades Authority; www.nlga.org.
149. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
150. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
151. NRCA - National Roofing Contractors Association; www.nrca.net.
152. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
153. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
154. NSPE - National Society of Professional Engineers; www.nspe.org.
155. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
156. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
157. NWFA - National Wood Flooring Association; www.nwfa.org.
158. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
159. PDI - Plumbing & Drainage Institute; www.pdionline.org.
160. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
161. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
162. RFCI - Resilient Floor Covering Institute; www.rfci.com.
163. RIS - Redwood Inspection Service; www.redwoodinspection.com.
164. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
165. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
166. SDI - Steel Deck Institute; www.sdi.org.
167. SDI - Steel Door Institute; www.steeldoor.org.
168. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
169. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
170. SIA - Security Industry Association; www.siaonline.org.
171. SJI - Steel Joist Institute; www.steeljoist.org.
172. SMA - Screen Manufacturers Association; www.smainfo.org.
173. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
174. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
175. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
176. SPIB - Southern Pine Inspection Bureau; www.spib.org.
177. SPRI - Single Ply Roofing Industry; www.spri.org.
178. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
179. SSINA - Specialty Steel Industry of North America; www.ssina.com.
180. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
181. STI - Steel Tank Institute; www.steeltank.com.
182. SWI - Steel Window Institute; www.steelwindows.com.
183. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
184. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
185. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
186. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
187. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
188. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
189. TMS - The Masonry Society; www.masonrysociety.org.
190. TPI - Truss Plate Institute; www.tpinst.org.
191. TPI - Turfgrass Producers International; www.turfgrasssod.org.

192. TRI - Tile Roofing Institute; www.tileroofing.org.
193. UBC - Uniform Building Code; (See ICC).
194. UL - Underwriters Laboratories Inc.; www.ul.com.
195. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
196. USAV - USA Volleyball; www.usavolleyball.org.
197. USGBC - U.S. Green Building Council; www.usgbc.org.
198. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
199. WASTEC - Waste Equipment Technology Association; www.wastec.org.
200. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
201. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
202. WDMA - Window & Door Manufacturers Association; www.wdma.com.
203. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
204. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
205. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
206. WPA - Western Wood Products Association; www.wwpa.org.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.
1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; http://dodssp.daps.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; http://eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeia; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and

regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF - State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR - California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS - California Department of Health Services; (See CDPH).
4. CDPH - California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC - California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD - South Coast Air Quality Management District; www.aqmd.gov.
7. TFS - Texas Forest Service; Forest Resource Development and Sustainable Forestry; http://txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. General: Use charges for temporary facilities shall be included in the Contract Sum.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Storage Areas, Enclosures and Coverings: Provide enclosures and coverings equipped to accommodate materials and equipment for construction operations.
1. Store combustible materials away from the building(s).

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

C. Electric Power Service: Use of Owner's existing electric power service will be permitted as long as equipment is maintained in a condition acceptable to Owner.

D. Telephone Service: Provide superintendent with cellular telephone equipped with voice mail.

3.3 SUPPORT FACILITIES INSTALLATION

A. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

B. Parking: Use designated areas of Owner’s existing parking areas for construction personnel.

C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

D. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Prohibit smoking in construction areas.

3.5 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

C. Temporary Facility Changeover: Do not change over from using temporary protection facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 015713 - TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

F. In general, the section includes all of the sediment and erosion control items needed to satisfy the regulatory authorities and may include, but not be limited to the following:

G. The Contractor Shall:
   1. Sign and obtain the Notice of Intent.
   2. Prepare and maintain a Best Management Practice Plan (BMP).
   3. Termination of the Notice of Intent.

1.02 RELATED SECTIONS

A. Section "Earthwork" for installation of the erosion and sediment control items.

1.03 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Documents: Documents affecting work of this section include but are not necessarily limited to Kentucky Storm Water General Permit, Kentucky Erosion Prevention and Sediment Control Field Guide.

1.04 RELATED REQUIREMENTS

A. RELATED REQUIREMENTS
   1. Section 311000 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.
   2. Section 312200 - Grading: Temporary and permanent grade changes for erosion control.
   3. Section 313700 - Riprap: Temporary and permanent stabilization using riprap.
   4. Section 321123 - Aggregate Base Courses: Temporary and permanent roadways.
   5. Section 329219 - Seeding: Permanent turf for erosion control.
   6. Section 329223 - Sodding: Permanent turf for erosion control.
   7. Section 329300 - Plants: Permanent plantings for erosion control.

B. REFERENCE STANDARDS
   1. ASTM D 4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus; 2007.
   2. ASTM D 4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2004).
   3. ASTM D 4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2004.
   4. ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2008.
   5. ASTM D 4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2004.

6. ASTM D 4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2002.
7. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; current edition.
8. FHWA FLP-94-005 - Best Management Practices for Erosion and Sediment Control; Federal Highway Administration; 1995.
9. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 1986.

1.05 PERFORMANCE REQUIREMENTS

A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP), whether the project is required by law to comply or not.

B. Also comply with all more stringent requirements of State of Kentucky Erosion and Sedimentation Control Manual.

C. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

E. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.

F. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

G. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
   1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
   2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

H. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
   1. Control movement of sediment and soil from temporary stockpiles of soil.
   2. Prevent development of ruts due to equipment and vehicular traffic.
   3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

I. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
   1. Prevent windblown soil from leaving the project site.
   2. Prevent tracking of mud onto public roads outside site.
   3. Prevent mud and sediment from flowing onto sidewalks and pavements.
   4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

J. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to

Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

K. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

L. Open Water: Prevent standing water that could become stagnant.

M. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.06 SUBMITTALS

A. NOI: Submit NOI to KPDES Branch, Division of Water, per attached instructions. A copy of the submitted NOI form shall be sent to the Architect and the Owner.

B. BMP: Submit BMP to appropriate regulatory agency. A copy shall be sent to the Architect and the Owner.

C. Subcontractor Signatures: Signatures of all subcontractors for approval stating that they have read, understand and that they intend to comply with the BMP. A copy of the signatures shall be submitted to the Architect and the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Mulch: Use one of the following:

1. Straw or hay.
2. Wood waste, chips, or bark.
3. Erosion control matting or netting.
4. Cutback asphalt.
5. Polyethylene film, where specifically indicated only.

B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

C. Bales: Air dry, rectangular straw bales.

1. Cross Section: 14 by 18 inches, minimum.
2. Bindings: Wire or string, around long dimension.

D. Bale Stakes: One of the following, minimum 3 feet long:

1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
2. Wood, 2 by 2 inches in cross section.

E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:

1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D 4751.
2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D 4491.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D 4632.

5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D 4632.
6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D 4533.
7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
8. Manufacturers:

F. Silt Fence Posts: One of the following, minimum 5 feet long:

G. Gravel: See Section 321123 for aggregate.

PART 3 - EXECUTION

3.01 Continuous Service: The sediment and erosion control items are to be installed prior to the commencement of all other construction activities on site. Continuous maintenance shall be required until the next contract has been signed. To transfer the Notice of Intent, a letter is to be written and signed by the new contractor. Once this letter has been received and approved by the Division of Water the Contractor's responsibility shall be relieved.

3.02 Prepare Daily Field Reports per BMP requirements. A sample form is attached. Submit to regulatory agency as required.

3.03 Prepare Erosion and Sediment Control Inspection and Maintenance Report Form weekly per BMP requirements. A sample form is attached. Submit to regulatory agency as required.

3.04 Remove temporary erosion sediment control measures when site is 95% stabilized. Seed and protect any disturbed areas with permanent grass protect mixture.

3.05 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.06 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.07 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.
1. Width: As required; 20 feet, minimum.
2. Length: 50 feet, minimum.
3. Provide at each construction entrance from public right-of-way.
4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.
1. Provide linear sediment barriers:
   a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
2. Space sediment barriers with the following maximum slope length upslope from barrier:
   a. Slope of Less Than 2 Percent: 100 feet.
   b. Slope Between 2 and 5 Percent: 75 feet.
   c. Slope Between 5 and 10 Percent: 50 feet.
   d. Slope Between 10 and 20 Percent: 25 feet.
   e. Slope Over 20 Percent: 15 feet.

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.

2. Straw bale row blocking entire inlet face area; anchor into pavement.

E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

G. Soil Stockpiles: Protect using one of the following measures:
1. Cover with polyethylene film, secured by placing soil on outer edges.
2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
2. Asphalt: Use only where no traffic, either vehicular or pedestrian, is anticipated.

I. Temporary Seeding: Use where temporary vegetated cover is required.

3.08 INSTALLATION

A. Traffic-Bearing Aggregate Surface:
1. Excavate minimum of 6 inches.
2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.

B. Silt Fences:
1. Store and handle fabric in accordance with ASTM D 4873.
2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
5. Install with top of fabric at nominal height and embedment as specified.
6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
7. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

C. Straw Bale Rows:
1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
2. Install bales so that bindings are not in contact with the ground.
3. Embed bales at least 4 inches in the ground.
4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
5. Fill gaps between ends of bales with loose straw wedged tightly.
6. Place soil excavated for trench against bales on the upslope side of the row, compacted.

D. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.

4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.09 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:
1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Straw Bale Rows:
1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
2. Remove silt deposits that exceed one-half of the height of the bales.
3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Clean out temporary sediment control structures weekly and relocate soil on site.

F. Place sediment in appropriate locations on site; do not remove from site.

3.10 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION 015713

SECTION 015723 - TEMPORARY STORM WATER POLLUTION CONTROL

1.1 SUMMARY

A. Section Includes:

1. Temporary stormwater pollution controls.

1.2 STORMWATER POLLUTION PREVENTION PLAN

A. The Stormwater Pollution Prevention Plan (SWPPP) is part of the Contract Documents and is bound into this Project Manual.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Stormwater Pollution Prevention Plan (SWPP): Within **15** days of date established for commencement of the Work, submit completed SWPPP.

B. EPA authorization under the EPA's "2017 Construction General Permit (CGP)."

C. Stormwater Pollution Prevention (SWPP) Training Log: For each individual performing Work under the SWPPP.

D. Inspection reports.

1.5 QUALITY ASSURANCE

A. Stormwater Pollution Prevention Plan (SWPPP) Coordinator: Experienced individual or firm with a record of successful water pollution control management coordination of projects with similar requirements.

1. SWPPP Coordinator shall complete and finalize the SWPPP form.
2. SWPPP Coordinator shall be responsible for inspections and maintaining of all requirements of the SWPPP.

B. Installers: Trained as indicated in the SWPPP.

PART 2 - PRODUCTS

2.1 TEMPORARY STORMWATER POLLUTION CONTROLS

A. Provide temporary stormwater pollution controls as required by the SWPPP.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with all best management practices, general requirements, performance requirements, reporting requirements, and all other requirements included in the SWPPP.

B. Locate stormwater pollution controls in accordance with the SWPPP.

C. Conduct construction as required to comply with the SWPPP and that minimize possible contamination or pollution or other undesirable effects.

1. Inspect, repair, and maintain SWPPP controls during construction.

a. Inspect all SWPPP controls not less than every seven days, and after each occurrence of a storm event, as outlined in the SWPPP.

D. Remove SWPPP controls at completion of construction and restore and stabilize areas disturbed during construction.

END OF SECTION 015723

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 002113 "Bid for Lump Sum Contract" for products selected under an alternate.
2. Section 012500 "Substitution Procedures" for requests for substitutions.
3. Section 014200 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
    b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Architect will make selection.
   5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
   6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

   1. Products:
      a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered prior to bid date.
   2. Manufacturers:
      a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with

requirements. Comparable products or substitutions for Contractor's convenience will be considered prior to bid date.

3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

B. Related Requirements:
1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

E. Certified Surveys: Submit two copies signed by land surveyor.

F. Final Property Survey: Submit 2 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    a. Primary operational systems and equipment.
    b. Fire-suppression systems.
    c. Mechanical systems piping and ducts.
    d. Control systems.
    e. Communication systems.
    f. Fire-detection and -alarm systems.
    g. Conveying systems.
    h. Electrical wiring systems.
    i. Operating systems of special construction.
2. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Sprayed fire-resistive material.
    d. Equipment supports.
    e. Piping, ductwork, vessels, and equipment.

3. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall

coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Pre-installation Conferences: Include Owner's construction personnel at pre-installation conferences covering portions of the Work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
   a. Use containers intended for holding waste materials of type to be stored.
4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Requirements:

1. Section 017300 "Execution" for progress cleaning of Project site.
2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
4. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit test/adjust/balance records.
5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Complete startup and testing of systems and equipment.
3. Perform preventive maintenance on equipment used prior to Substantial Completion.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
5. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
6. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
7. Complete final cleaning requirements, including touchup painting.
8. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Remove tools, construction equipment, machinery, and surplus material from Project site.
    c. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    d. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    e. Remove labels that are not permanent.
    f. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    g. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    h. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

        1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

    i. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
    j. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Operation manuals for systems, subsystems, and equipment.
3. Product maintenance manuals.
4. Systems and equipment maintenance manuals.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
b. Enable inserted reviewer Comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.

C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.

5. Name and contact information for Contractor.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.

3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Engineering data and tests.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.

4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."

F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Product Data.

B. Related Requirements:

1. Section 017300 "Execution" for final property survey.
2. Section 017700 "Closeout Procedures" for general closeout procedures.
3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.
2. Number of Copies: Submit copies of record Drawings as follows:

a. Initial Submittal:

1) Submit one paper-copy set(s) of marked-up record prints.
2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit one paper-copy set(s) of marked-up record prints.

B. Record Specifications: Submit one paper copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy of each submittal.

E. Reports: Submit written report indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an acceptable drawing technique.
    c. Record data as soon as possible after obtaining it.
    d. Record and check the markup before enclosing concealed installations.
    e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations below first floor.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Changes made by Change Order or Construction Change Directive.
    i. Changes made following Architect's written orders.
    j. Details not on the original Contract Drawings.
    k. Field records for variable and concealed conditions.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

2.2 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

    1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
    2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
    3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as paper copy.

    1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

B. Unit Price for Instruction Time: Length of instruction time will be measured by actual time spent performing demonstration and training in required location. No payment will be made for time spent assembling educational materials, setting up, or cleaning up. See requirements in Section 012200 "Unit Prices."

1.3 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.
    l. Required sequences for electric or electronic systems.
    m. Special operating instructions and procedures.

4. Adjustments: Include the following:

    a. Alignments.
    b. Checking adjustments.

c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

5. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

6. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 017900

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Owner's Project Requirements and Basis-of-Design documentation are included by reference for information only.

1.2 SUMMARY

A. The Fundamental commissioning of the building energy systems will be performed by a certified Commissioning Agent under a separate contract with the Owner. The Mechanical Contractor, Temperature Control Contractor, Testing and Balancing Contractor, Electrical Contractor and any other sub-contractor that the Commissioning Agent deems necessary, shall assist the commissioning agent as required.

B. Section Includes:

1. General requirements for coordinating and scheduling commissioning.
2. Commissioning meetings.
3. Commissioning reports.
4. Use of test equipment, instrumentation, and tools for commissioning.
5. Construction checklists, including, but not limited to, installation checks, startup, performance tests, and performance test demonstration.
6. Commissioning tests and commissioning test demonstration.
7. Adjusting, verifying, and documenting identified systems and assemblies.

C. Related Requirements:

1. Section 013300 "Submittal Procedures" for submittal procedures requirements for commissioning.
2. Section 017700 "Closeout Procedures" for certificate of Construction Phase Commissioning Completion submittal requirements.
3. Section 017823 "Operation and Maintenance Data" for preliminary operation and maintenance data submittal.
4. Section 230800 "Commissioning of HVAC" for technical commissioning requirements for HVAC.
5. Section 260923 "Lighting Controls" for technical commissioning requirements for electrical systems.

1.3 DEFINITIONS

A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests and commissioning test demonstrations.

B. Basis-of-Design Document: A document prepared by Owner, Architect, or Commissioning Authority that records concepts, calculations, decisions, and product selections used to comply with Owner's Project Requirements and to suit applicable regulatory requirements, standards, and guidelines.

C. Commissioning Authority: An entity engaged by Owner, and identified in Section 011000 "Summary," to evaluate Commissioning-Process Work.

D. Commissioning Plan: A document, prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation requirements of commissioning.

E. Commissioning: A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with Owner's Project Requirements. The requirements specified here are limited to the construction phase commissioning activities.

F. Construction Phase Commissioning Completion: The stage of completion and acceptance of commissioning when resolution of deficient conditions and issues discovered during commissioning and retesting until acceptable results are obtained has been accomplished. Owner will establish in writing the date Construction Phase Commissioning Completion is achieved. See Section 017700 "Closeout Procedures" for certificate of Construction Phase Commissioning Completion submittal requirements.

1. Commissioning is complete when the work specified in this Section and related Sections has been completed and accepted, including, but not limited to, the following:

a. Completion of tests and acceptance of test results.

b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.

c. Comply with requirements in Section 017900 "Demonstration and Training."

d. Completion and acceptance of submittals and reports.

G. Owner's Project Requirements: A document written by Owner, Architect, or Commissioning Authority that details the functional requirements of a project and the expectations of how it will be used and operated, including Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

H. Owner's Witness: Commissioning Authority, Owner's Project Manager, or Architect-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.

I. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.

J. Test: Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.

K. Sampling Procedures and Tables for Inspection by Attributes: As defined in ASQ Z1.4.

1.4 COMMISSIONING TEAM

A. Members Appointed by Construction Manager/General Contractor:

1. Commissioning authority, plus consultants that Commissioning Authority may deem appropriate for a particular portion of the commissioning. Approved Commissioning Agents shall be ZH Commissioning, Facilities Commissioning Group, or SSRCx only. The commissioning authority contractor shall be a subcontractor to the General Contractor.

2. Project superintendent and other employees that Contractor may deem appropriate for a particular portion of the commissioning.

3. Subcontractors, installers, suppliers, and specialists that Contractor may deem appropriate for a particular portion of the commissioning.

4. Appointed team members shall have the authority to act on behalf of the entity they represent.

B. Members Appointed by Owner:

1. Owner representative, facility operations and maintenance personnel, plus other employees, separate contractors, and consultants that Owner may deem appropriate for a particular portion of the commissioning.

2. Architect, plus employees and consultants that Architect may deem appropriate for a particular portion of the commissioning.

1.5 INFORMATIONAL SUBMITTALS

A. Comply with requirements in Section 013300 "Submittal Procedures" for submittal procedures general requirements for commissioning.

B. Commissioning Plan Information:

1. List of Contractor-appointed commissioning team members to include specific personnel and subcontractors to the performance of the various commissioning requirements.

2. Schedule of commissioning activities, integrated with the construction schedule. Comply with requirements in Section 013200 "Construction Progress Documentation" for construction schedule general requirements for commissioning.

3. Contractor personnel and subcontractors to participate in each test.

4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.

C. Commissioning schedule.

D. Two-week look-ahead schedules.

E. List test instrumentation, equipment, and monitoring devices. Include the following information:

1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.

2. Brief description of intended use.

3. Calibration record showing the following:

a. Calibration agency, including name and contact information.

b. Last date of calibration.

c. Range of values for which calibration is valid.

d. Certification of accuracy.

e. N.I.S.T. traceability certification for calibration equipment.

f. Due date of the next calibration.

F. Test Reports:

1. Pre-Startup Report: Prior to startup of equipment or a system, submit signed, completed construction checklists.

2. Test Data Reports: At the end of each day in which tests are conducted, submit test data for tests performed.

3. Commissioning Issues Reports: Daily, at the end of each day in which tests are conducted, submit commissioning issue reports for tests for which acceptable results were not achieved.

4. Weekly Progress Report: Weekly, at the end of each week in which tests are conducted, submit a progress report.

5. Data Trend Logs: Submit data trend logs at the end of the trend log period.

6. System Alarm Logs: Daily, at the start of days following a day in which tests were performed, submit print-out of log of alarms that occurred since the last log was printed.

G. Construction Checklists:

1. Material checks.

2. Installation checks.

3. Startup procedures, where required.

1.6 CLOSEOUT SUBMITTALS

A. Commissioning Report:

1. At Construction Phase Commissioning Completion, include the following:

a. Pre-startup reports.

b. Approved test procedures

c. Test data forms, completed and signed.

d. Progress reports.

e. Commissioning issues report log.

f. Commissioning issues reports showing resolution of issues.

g. Correspondence or other documents related to resolution of issues.

h. Other reports required by commissioning.

i. List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction Phase Commissioning Completion.

j. Report shall include commissioning work of Contractor.

B. Request for Certificate of Construction Phase Commissioning Completion.

C. Operation and Maintenance Data: For proprietary test equipment, instrumentation, and tools to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Commissioning Authority Qualifications:

1. Documented experience commissioning systems of similar complexity to those contained in these documents on at least 3 (three) projects of similar scope and complexity.

2. Certification of commissioning process expertise. The following certifications are acceptable. Owner reserves the right to accept or reject certifications as evidence of qualification.

   a. Certified Commissioning Professional, by Building Commissioning Association.

   b. Commissioning Process Management Professional, by American Society of Heating, Refrigerating and Air-Conditioning Engineers.

   c. Accredited Commissioning Process Authority Professional, by University of Wisconsin.

   d. Accredited Commissioning Process Manager, by University of Wisconsin.

   e. Accredited Green Commissioning Process Provider, by University of Wisconsin.

B. Calibration Agency Qualifications: Certified by The American Association of Laboratory Accreditation that the calibration agency complies with minimum requirements of ISO/IEC 17025.

1.8 COMMISSIONING AUTHORITY'S RESPONSIBILITIES

A. Commissioning Authority Responsibilities:

1. During the construction phase the commissioning agency shall carry out the following scope of work:

   a. Organize and lead the commissioning team.

   b. Review shop drawings and equipment submittals for information affecting the commissioning process.

   c. Update the commissioning plan to reflect equipment and controls data from the submittals, and provide commissioning schedule information that the contractor can integrate into the project schedule.

   d. Schedule and lead commissioning meetings.

   e. Establish and maintain a system for tracking issues needing resolution.

   f. Review the project schedule periodically to ensure commissioning activities are properly incorporated; provide feedback to the designer as needed.

   g. Perform on-site observations during construction.

   h. Monitor correct component and equipment installation; including controls point-to-point checkouts. Document all observations.

   i. Witness equipment and system start-ups as deemed necessary. Ensure complete documentation of same.

2. During the acceptance phase the commissioning agency shall carry out the following scope of work:

   a. Review and inspect, on a sample basis, the testing, adjusting and balancing work that has been carried out by another agency.

b. Conduct functional performance testing of sub-systems, systems and interactions between systems, leading to acceptance of the completed work. Document results of all tests witnessed.

c. Organize and direct the training of O&M Personnel.

d. Videotape O&M staff training sessions.

3. During the post-acceptance phase the commissioning agency shall carry out the following scope of work:

a. Conduct functional performance testing of sub-systems, systems, and interactions between systems that could not be carried out prior to acceptance phase due to unsuitable weather conditions.

b. Prepare and submit a final commissioning report.

c. Provide follow-up for quality performance during the guarantee period.

1.9 SCOPE OF WORK

A. Systems to be commissioned:

1. Supply Air
2. Return Air
3. Exhaust Air
4. HVAC Equipment
5. HVAC Control system
6. Electrical Lighting Control System

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Test equipment and instrumentation required to perform the commissioning shall remain the property of Contractor unless otherwise indicated.

B. Test equipment and instrumentation required to perform commissioning shall comply with the following criteria:

1. Be manufactured for the purpose of testing and measuring tests for which they are being used and have an accuracy to test and measure system performance within the tolerances required to determine acceptable performance.

2. Calibrated and certified.

a. Calibration performed and documented by a qualified calibration agency according to national standards applicable to the tools and instrumentation being calibrated. Calibration shall be current according to national standards or within test equipment and instrumentation manufacturer's recommended intervals, whichever is more frequent, but not less than within six months of initial use on Project. Calibration tags permanently affixed.

b. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.

3. Maintain test equipment and instrumentation.

4. Use test equipment and instrumentation only for testing or monitoring Work for which they are designed.

2.2 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate or perform work on its equipment.

1. Identify proprietary test equipment, instrumentation, and tools required in the test equipment identification list submittal.

2. Proprietary test equipment, instrumentation, and tools shall become the property of Owner at Substantial Completion.

2.3 REPORT FORMAT AND ORGANIZATION

A. General Format and Organization:

1. Bind report in three-ring binders.

2. Label the front cover and spine of each binder with the report title, volume number, project name, Contractor's name, and date of report.

3. Record report on compact disk.

4. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.

B. Commissioning Report:

1. Include a table of contents and an index to each test.

2. Include major tabs for each Specification Section.

3. Include minor tabs for each test.

4. Within each minor tab, include the following:

a. Test specification.

b. Pre-startup reports.

c. Approved test procedures.

d. Test data forms, completed and signed.

e. Commissioning issue reports, showing resolution of issues, and documentation related to resolution of issues pertaining to a single test. Group data forms, commissioning issue reports showing resolution of issues, and documentation related to resolution of issues for each test repetition together within the minor tab, in reverse chronological order (most recent on top).

PART 3 - EXECUTION

3.1 PREPARATION

A. Review preliminary construction checklists and preliminary test procedures and data forms.

3.2 CONSTRUCTION CHECKLISTS

A. Construction checklists cannot modify or conflict with the Contract Documents.

B. Create construction checklists based on actual systems and equipment to be included in Project.

C. Material Checks: Compare specified characteristics and approved submittals with materials as received. Include factory tests and other evaluations, adjustments, and tests performed prior to shipment, if applicable.

1. Services connection requirements, including configuration, size, location, and other pertinent characteristics.

2. Included optional features.

3. Delivery Receipt Check: Inspect and record physical condition of materials and equipment on delivery to Project site, including agreement with approved submittals, cleanliness and lack of damage.

4. Installation Checks:

a. Location according to Drawings and approved Shop Drawings.

b. Configuration.

c. Compliance with manufacturers' written installation instructions.

d. Attachment to structure.

e. Access clearance to allow for maintenance, service, repair, removal, and replacement without the need to disassemble or remove other equipment or building elements. Access coordinated with other building elements and equipment, including, but not limited to, ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.

f. Utility connections are of the correct characteristics, as applicable.

g. Correct labeling and identification.

h. Startup Checks: Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.

D. Startup: Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, minimum.

E. Performance Tests:

1. Static Tests: As specified elsewhere, including, but not limited to, duct and pipe leakage tests, insulation-resistance tests, and water-penetration tests.

2. Component Performance Tests: Tests evaluate the performance of an input or output of components under a full range of operating conditions.

3. Equipment and Assembly Performance Tests: Test and evaluate performance of equipment and assemblies under a full range of operating conditions and loads.

4. System Performance Tests: Test and evaluate performance of systems under a full range of operating conditions and loads.

5. Intersystem Performance Tests: Test and evaluate the interface of different systems under a full range of operating conditions and loads.

F. Deferred Construction Checklists: Obtain Owner approval of proposed deferral of construction checklists, including proposed schedule of completion of each deferred construction checklist, before submitting request for Certificate of Construction Phase

Commissioning Completion. When approved, deferred construction checklists may be completed after date of Construction Phase Commissioning Completion. Include the following in request for Certificate of Construction Phase Commissioning Completion:

1. Identify deferred construction checklists by number and title.
2. Provide a target schedule for completion of deferred construction checklists.
3. Written approval of proposed deferred construction checklists, including approved schedule of completion of each deferred construction checklist.

G. Delayed Construction Checklists: Obtain Owner approval of proposed delayed construction checklists, including proposed schedule of completion of each delayed construction checklist, before submitting request for Certificate of Construction Phase Commissioning Completion. When approved, delayed construction checklists may be completed after date of Construction Phase Commissioning Completion. Include the following in request for Certificate of Construction Phase Commissioning Completion:

1. Identify delayed construction checklist by construction checklist number and title.
2. Provide a target schedule for completion of delayed construction checklists.
3. Written approval of proposed delayed construction checklists, including approved schedule of completion of each delayed construction checklist.

3.3 GENERAL EXECUTION REQUIREMENTS

A. Schedule and coordinate commissioning with the construction schedule.

B. Perform activities identified in construction checklists, including tests, and document results of actions as construction proceeds.

C. Perform test demonstrations for Owner's witness. Unless otherwise indicated, demonstrate tests for 100 percent of work to which the test applies.

D. Report test data and commissioning issue resolutions.

E. Schedule personnel to participate in and perform Commissioning-Process Work.

F. Installing contractors' commissioning responsibilities include, but are not limited to, the following:

1. Operating the equipment and systems they install during tests.
2. In addition, installing contractors may be required to assist in tests of equipment and systems with which their work interfaces.

3.4 COMMISSIONING TESTING

A. Quality Control: Construction checklists, including tests, are quality-control tools designed to improve the functional quality of Project. Test demonstrations evaluate the effectiveness of Contractor's quality-control process.

B. Owner's witness will be present to witness commissioning work requiring the signature of an owner's witness, including, but not limited to, test demonstrations. Owner's project manager will coordinate attendance by Owner's witness with Contractor's published commissioning schedule. Owner's witness will provide no labor or materials in the commissioning work. The only function of Owner's witness will be to observe and comment on the progress and results of commissioning.

C. Construction Checklists:

1. Complete construction checklists as Work is completed.
2. Distribute construction checklists to installing contractors before they start work.

3. Installers:

   a. Verify installation using approved construction checklists as Work proceeds.

   b. Complete and sign construction checklists weekly for work performed during the preceding week.

4. Provide Commissioning Authority access to construction checklists.

D. Installation Compliance Issues: Record as an installation compliance issue Work found to be incomplete, inaccessible, at variance with the Contract Documents, nonfunctional, or that does not comply with construction checklists. Record installation compliance issues on the construction checklist at the time they are identified. Record corrective action and how future Work should be modified before signing off the construction checklist.

E. Pre-Startup Audit: Prior to executing startup procedures, review completed installation checks to determine readiness for startup and operation. Report conditions, which, if left uncorrected, adversely impact the ability of systems or equipment to operate satisfactorily or to comply with acceptance criteria. Prepare pre-startup report for each system.

F. Test Procedures and Test Data Forms:

1. Test procedures shall define the step-by-step procedures to be used to execute tests and test demonstrations.

2. Test procedures shall be specific to the make, model, and application of the equipment and systems being tested.

3. Completed test data forms are the official records of the results of tests.

4. Commissioning Authority will provide to Contractor preliminary test procedures and test data forms for performance tests and commissioning tests after approval of Product Data, Shop Drawings, and preliminary operation and maintenance manual.

5. Review preliminary test procedures and test data forms and provide comments within 14 days of receipt from Commissioning Authority. Review shall address the following:

   a. Equipment protection and warranty issues, including, but not limited to, manufacturers' installation and startup recommendations, and operation and maintenance instructions.

   b. Applicability of the procedure to the specific software, equipment, and systems approved for installation.

6. After Contractor has reviewed and commented on the preliminary test procedures and test data forms, Commissioning Authority will revise and reissue the approved revised test procedures and test data forms marked "Approved for Testing."

7. Use only approved test procedures and test data forms marked "Approved for Testing" to perform and document tests and test demonstrations.

G. Performance of Tests:

1. The sampling rate for tests is 100 percent. The sampling rate for test demonstrations is 100 percent unless otherwise indicated.

2. Perform and complete each step of the approved test procedures in the order listed.

3. Record data observed during performance of tests on approved data forms at the time of test performance and when the results are observed.

4. Record test results that are not within the range of acceptable results on commissioning issue report forms in addition to recording the results on approved test procedures and data forms according to the "Commissioning Compliance Issues" Paragraph in this Article.

5. On completion of a test, sign the completed test procedure and data form. Tests for which test procedures and data forms are incomplete, not signed, or which indicate performance that does not comply with acceptance criteria will be rejected. Tests for which test procedures and data forms are rejected shall be repeated and results resubmitted.

H. Performance of Test Demonstration:

1. Perform test demonstrations on a sample of tests after test data submittals are approved. The sampling rate for test demonstrations shall be 100 percent unless otherwise indicated in the individual test specification.

2. Notify Owner's witness at least 3 (three) in advance of each test demonstration.

3. Perform and complete each step of the approved test procedures in the order listed.

4. Record data observed during performance of test demonstrations on approved data forms at the time of demonstration and when the results are observed.

5. Provide full access to Owner's witness to directly observe the performance of all aspects of system response during the test demonstration. On completion of a test demonstration, sign the completed data form and obtain signature of Owner's witness at the time of the test to authenticate the reported results.

6. Test demonstration data forms not signed by Contractor and Owner's witness at the time of the completion of the procedure will be rejected. Test demonstrations for which data forms are rejected shall be repeated and results shall be resubmitted.

    a. Exception for Failure of Owner's Witness to Attend: Failure of Owner's witness to be present for agreed-on schedule of test demonstration shall not delay Contractor. If Owner's witness fails to attend a scheduled test, Contractor shall proceed with the scheduled test. On completion, Contractor shall sign the data form for Contractor and for Owner's witness, and shall note the absence of Owner's witness at the scheduled time and place.

7. False load test requirements are specified in related sections.

    a. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply the specified load to the system. False load system shall be capable of steady-state operation and modulation at the level of load specified. Equipment and systems permanently installed in this work shall not be used to create the false load without Architect's written approval.

I. Deferred Tests:

1. Deferred Tests List: Identify, in the request for Certificate of Construction Phase Commissioning Completion, proposed deferred tests or other tests approved for deferral until specified seasonal or other conditions are available. When approved,

deferred tests may be completed after the date of Construction Phase Commissioning Completion. Identify proposed deferred tests in the request for Certificate of Construction Phase Commissioning Completion as follows:

a. Identify deferred tests by number and title.

b. Provide a target schedule for completion of deferred tests.

2. Schedule and coordinate deferred tests. Schedule deferred tests when specified conditions are available. Notify Architect and Commissioning Authority at least 3 (three) days (minimum) in advance of tests.

3. Where deferred tests are specified, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule deferred tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

J. Delayed Tests:

1. Delayed Tests List: Identify, in the request for Certificate of Construction Phase Commissioning Completion, proposed delayed tests. Obtain Owner approval of proposed delayed tests, including proposed schedule of completion of each delayed test, before submitting request for Certificate of Construction Phase Commissioning Completion. Include the following in the request for Certificate of Construction Phase Commissioning Completion:

a. Identify delayed tests by test number and title.

b. Written approval of proposed delayed tests, including approved schedule of completion of delayed tests.

2. Schedule and coordinate delayed tests. Schedule delayed tests when conditions that caused the delay have been rectified. Notify Architect and Commissioning Authority at least 3 (three) working days (minimum) in advance of tests.

3. Where delayed tests are approved, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule delayed tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

K. Commissioning Compliance Issues:

1. Test results that are not within the range of acceptable results are commissioning compliance issues.

2. Track and report commissioning compliance issues until resolution and retesting are successfully completed.

3. If a test demonstration fails, determine the cause of failure. Direct timely resolution of issue and then repeat the demonstration. If a test demonstration must be repeated due to failure caused by Contractor work or materials, reimburse Owner for billed costs for the participation in the repeated demonstration.

4. Test Results: If a test demonstration fails to meet the acceptance criteria, perform the following:

a. Complete a commissioning compliance issue report form promptly on discovery of test results that do not comply with acceptance criteria.

b. Submit commissioning compliance issue report form within 24 hours of the test.

c. Determine the cause of the failure.

d. Establish responsibility for corrective action if the failure is due to conditions found to be Contractor's responsibility.

5. Commissioning Compliance Issue Report: Provide a commissioning compliance issue report for each issue. Do not report multiple issues on the same commissioning compliance issue report.

   a. Exception: If an entire class of devices is determined to exhibit the identical issue, they may be reported on a single commissioning compliance issue report. (For example, if all return-air damper actuators that are specified to fail to the open position are found to fail to the closed position, they may be reported on a single commissioning issue report. If a single commissioning issue report is used for multiple commissioning compliance issues, each device shall be identified in the report, and the total number of devices at issue shall be identified.

   b. Complete and submit Part 1 of the commissioning compliance issue report immediately when the condition is observed.

   c. Record the commissioning compliance issue report number and describe the deficient condition on the data form.

   d. Resolve commissioning compliance issues promptly. Complete and submit Part 2 of the commissioning compliance issue report when issues are resolved.

6. Diagnose and correct failed test demonstrations as follows:

   a. Perform diagnostic tests and activities required to determine the fundamental cause of issues observed.

   b. Record each step of the diagnostic procedure prior to performing the procedure. Update written procedure as changes become necessary.

   c. Record the results of each step of the diagnostic procedure.

   d. Record the conclusion of the diagnostic procedure on the fundamental cause of the issue.

   e. Determine and record corrective measures.

   f. Include diagnosis of fundamental cause of issues in commissioning compliance issue report.

7. Retest:

   a. Schedule and repeat the complete test procedure for each test demonstration for which acceptable results are not achieved. Obtain signature of Owner's witness on retest data forms. Repeat test demonstration until acceptable results are achieved. Except for issues that are determined to result from design errors or omissions, or other conditions beyond Contractor's responsibility, compensate Owner for direct costs incurred as the result of repeated test demonstrations to achieve acceptable results.

   b. For each repeated test demonstration, submit a new test data form, marked "Retest."

8. Do not correct commissioning compliance issues during test demonstrations.

   a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than 5 (five) minutes. If corrections are made under this exception, note the deficient conditions on the test data

form and issue a commissioning compliance issue report. A new test data form, marked "Retest," shall be initiated after the resolution has been completed.

3.5 COMMISSIONING MEETINGS

A. Commissioning Authority will schedule and conduct commissioning meetings. Comply with requirements in Section 013100 "Project Management and Coordination."

3.6 SEQUENCING

A. Sequencing of Commissioning Verification Activities: For a particular material, item of equipment, assembly, or system, perform the following in the order listed unless otherwise indicated:

1. Construction Checklists:

a. Material checks.

b. Installation checks.

c. Start up, as appropriate. Some startup may depend on component performance. Such startup may follow component performance tests on which the startup depends.

d. Performance Tests:

1) Static tests, as appropriate.

2) Component performance tests. Some component performance tests may depend on completion of startup. Such component performance tests may follow startup.

3) Equipment and assembly performance tests.

4) System performance tests.

5) Intersystem performance tests.

2. Commissioning tests.

B. Before performing commissioning tests, verify that materials, equipment, assemblies, and systems are delivered, installed, started, and adjusted to perform according to construction checklists.

C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing test demonstrations. Notify Architect if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.

D. Commence tests as soon as installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided the incomplete work does not interfere with successful execution of test.

3.7 SCHEDULING

A. Commence commissioning as early in the construction period as possible.

B. Commissioning Schedule: Integrate commissioning into Contractor's construction schedule. See Section 013200 "Construction Progress Documentation."

1. Include detailed commissioning activities in monthly updated Contractor's construction schedule and short interval schedule submittals.

2. Schedule the start date and duration for the following commissioning activities:

a. Submittals.

b. Preliminary operation and maintenance manual submittals.

c. Installation checks.

d. Startup, where required.

e. Performance tests.

f. Performance test demonstrations.

g. Commissioning tests.

h. Commissioning test demonstrations.

3. Schedule shall include a line item for each installation check, startup, and test activity specific to the equipment or systems involved.

4. Determine milestones and prerequisites for commissioning. Show commissioning milestones, prerequisites, and dependencies in monthly updated critical-path-method construction schedule and short interval schedule submittals.

C. Two-Week Look-Ahead Commissioning Schedule:

1. Two weeks prior to the beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for the duration of commissioning.

2. Two-week look-ahead schedules shall identify the date, time, beginning location, Contractor personnel required, and anticipated duration for each startup or test activity.

3. Use two-week look-ahead schedules to notify and coordinate participation of Owner's witnesses.

D. Owner's Witness Coordination:

1. Coordinate Owner's witness participation via Architect.

2. Notify Architect of commissioning schedule changes at least 2 (two) working days in advance for activities requiring the participation of Owner's witness.

3.8 COMMISSIONING REPORTS

A. Test Reports:

1. Pre-startup reports include observations of the conditions of installation, organized into the following sections:

a. Equipment Model Verification: Compare contract requirements, approved submittals, and provided equipment. Note inconsistencies.

b. Preinstallation Physical Condition Checks: Observe physical condition of equipment prior to installation. Note conditions including, but not limited to, physical damage, corrosion, water damage, or other contamination or dirt.

c. Preinstallation Component Verification Checks: Verify components supplied with the equipment, preinstalled or field installed, are correctly installed and functional. Verify external components required for proper operation of equipment correctly installed and functional. Note missing, improperly configured, improperly installed, or nonfunctional components.

d. Summary of Installation Compliance Issues and Corrective Actions: Identify installation compliance issues and the corrective actions for each. Verify that issues noted have been corrected.

e. Evaluation of System Readiness for Startup: For each item of equipment for each system for which startup is anticipated, document in summary form acceptable to Owner completion of equipment model verification, preinstallation physical condition checks, preinstallation component verification checks, and completion of corrective actions for installation compliance issues.

2. Test data reports include the following:

a. "As-tested" system configuration. Complete record of conditions under which the test was performed, including, but not limited to, the status of equipment, systems, and assemblies; temporary adjustments and settings; and ambient conditions.

b. Data and observations, including, but not limited to, data trend logs, recorded during the tests.

c. Signatures of individuals performing and witnessing tests.

d. Data trend logs accumulated overnight from the previous day of testing.

3. Commissioning Compliance Issues Reports: Report as commissioning compliance issues results of tests and test demonstrations that do not comply with acceptance criteria. Report only one issue per commissioning compliance issue report. Use sequentially numbered facsimiles of commissioning compliance issue report form included in this Section, or other form approved by Owner. Distribute commissioning compliance issue reports to parties responsible for taking corrective action. Identify the following:

a. Commissioning compliance issue report number. Assign unique, sequential numbers to individual commissioning compliance issue reports when they are created, to be used for tracking.

b. Action distribution list.

c. Report date.

d. Test number and description.

e. Equipment identification and location.

f. Briefly describe observations about the performance associated with failure to achieve acceptable results. Identify the cause of failure if apparent.

g. Diagnostic procedure or plan to determine the cause (include in initial submittal)

h. Diagnosis of fundamental cause of issues as specified below (include in resubmittal).

i. Fundamental cause of unacceptable performance as determined by diagnostic tests and activities.

j. When issues have been resolved, update and resubmit the commissioning issue report forms by completing Part 2. Identify resolution taken and the dates and initials of the persons making the entries.

k. Schedule for retesting.

4. Weekly progress reports include information for tests conducted since the preceding report and the following:

   a. Completed data forms.

   b. Equipment or system tested, including test number, system or equipment tag number and location, and notation about the apparent acceptability of results.

   c. Activities scheduled but not conducted per schedule.

   d. Commissioning compliance issue report log.

   e. Schedule changes for remaining Commissioning-Process Work, if any.

5. Data trend logs shall be initiated and running prior to the time scheduled for the test demonstration.

   a. Trend log data format shall be multiple data series graphs. Where multiple data series are trend logged concurrently, present the data on a common horizontal time axis. Individual data series may be presented on a segmented vertical axis to avoid interference of one data series with another, and to accommodate different axis scale values. Graphs shall be sufficiently clear to interpret data within the accuracy required by the acceptance criteria.

   b. Attach to the data form printed trend log data collected during the test or test demonstration.

   c. Record, print out, and attach to the data form operator activity during the time the trend log is running. During the time the trend log is running, operator intervention not directed by the test procedure invalidates the test results.

6. System Alarm Logs: Record and print out a log of alarms that occurred since the last log was printed. Evaluate alarms to determine if the previous day's work resulted in any conditions that are not considered "normal operation."

   a. Conditions that are not considered "normal operation" shall be reported on a commissioning issue report attached to the alarm log. Resolve as necessary. The intent of this requirement is to discover control system points or sequences left in manual or disabled conditions, equipment left disconnected, set points left with abnormal values, or similar conditions that may have resulted from failure to fully restore systems to normal, automatic control after test completion.

3.9 CERTIFICATE OF CONSTRUCTION PHASE COMMISSIONING COMPLETION

A. When Contractor considers that construction phase commissioning, or a portion thereof which Owner agrees to accept separately, is complete, Contractor shall prepare and submit to Owner and Commissioning Authority through Architect a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter Contractor's responsibility to compete commissioning.

B. On receipt of Contractor's list, Commissioning Authority will make an inspection to determine whether the construction phase commissioning or designated portion thereof is complete. If Commissioning Authority's inspection discloses items, whether included on Contractor's list, which is not sufficiently complete as defined in "Construction Phase Commissioning Completion" Paragraph in the "Definitions" Article, Contractor shall, before issuance of the Certificate of Construction Phase Completion, complete or correct such items on notification by Commissioning Authority. In such case, Contractor shall then

submit a request for another inspection by Commissioning Authority to determine construction phase commissioning completion.

C. Contractor shall promptly correct deficient conditions and issues discovered during commissioning. Costs of correcting such deficient conditions and issues, including additional testing and inspections, the cost of uncovering and replacement, and compensation for Architect's and Commissioning Authority's services and expenses made necessary thereby, shall be at Contractor's expense.

D. When construction phase commissioning or designated portion is complete, Commissioning Authority will prepare a Certificate of Construction Phase Commissioning that shall establish the date of completion of construction phase commissioning. Certificate of Construction Phase Commissioning Completion shall be submitted prior to requesting inspection for determining date of Substantial Completion.

END OF SECTION 019113

PROJECT MANUAL

VOLUME #2

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
Munfordville, Kentucky

SCB 2210 / BG# 23-277
JULY 2023

OWNER
Hart County Board of Education
Munfordville, Kentucky

SUPERINTENDENT – Nathan Smith

ARCHITECTS, CIVIL & STRUCTURAL ENGINEERS:
SHERMAN CARTER BARNHART ARCHITECTS, PLLC
144 TURNER COMMONS WAY, SUITE 110
LEXINGTON, KENTUCKY 40509
859-224-1351

MECHANICAL / ELECTRICAL / PLUMBING:
CMTA
10411 MEETING STREET
PROSPECT, KENTUCKY 40059
502-326-3085

STRUCTURAL ENGINEER:
POAGE ENGINEERS AND ASSOCIATES
880 SPARTA COURT, SUITE 200
LEXINGTON, KY 40504
859-255-9034

TABLE OF CONTENTS
VOLUME 2 OF 3
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
SCB PROJECT NO. 2210 / BG #23-277

Unless noted otherwise, the following shall apply to all manufacturers listed herein. Subject to compliance with Contract Documents, manufactures listed are approved as a manufacturer only. This does not imply that specific products supplied by such manufacturers have been reviewed and comply with requirements. It shall be the manufacturer's / contractor's responsibility to ensure that <u>all</u> requirements of the Contract Documents are met.

Facility Construction Subgroup

076200 - Sheet Metal Flashing and Trim
079200 - Joint Sealants
079219 - Acoustical Joint Sealants

DIVISION 08 - OPENINGS
081113 - Hollow Metal Doors and Frames
081416 - Flush Wood Doors
083313 - Coiling Counter Doors
084113 - Aluminum-Framed Entrances and Storefronts
087100 - Door Hardware
088000 - Glazing

DIVISION 09 - FINISHES
092216 - Non-Structural Metal Framing
092900 - Gypsum Board
093000 - Tiling
095113 - Acoustical Panel Ceilings
096513 - Resilient Base and Accessories
096518 - Luxury Vinyl Tile
096519 - Resilient Tile Flooring
096623 - Resinous Matrix Terrazzo Flooring
099113 - Exterior Painting
099123 - Interior Painting

DIVISION 10 - SPECIALTIES
101100 - Visual Display Units
101416 - Plaques
101419 - Dimensional Letter Signage
101423 - Panel Signage
102600 - Wall Protection
102800 - Toilet, Bath, and Laundry Accessories
104413 - Fire Protection Cabinets
104416 - Fire Extinguishers
105113 - Metal Lockers
105300 - Aluminum Protective Canopies

DIVISION 11 - EQUIPMENT
114000 - Food Service Equipment

DIVISION 12 - FURNISHINGS
123216 - Laminate Clad Casework

DIVISION 13 - SPECIAL CONSTRUCTION- N/A

DIVISION 14 - CONVEYING EQUIPMENT – N/A

SECTION 023200 - GEOTECHNICAL INVESTIGATION AND REPORT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Geotechnical investigation and report:

1. The geotechnical investigation in regards to sub-surface conditions is included for information only.

2. The geotechnical recommendations in the report are a part of the contract documents, unless specifically noted otherwise.

3. A geotechnical investigation report for Project, prepared by Solid Ground Consultaing Engineers is attached for convenience only.

B. Use of data:

1. This subsurface investigation was obtained only for the Architect/ Engineer use in design and is not a part of the Contract Documents.

2. The Architect/Engineer/Owner takes no responsibility for the conclusions that individual contractors may reach upon review

3. The subsurface investigation is available for bidders' information, but is not a warranty of subsurface conditions.

4. Bidders should visit the site and acquaint themselves with existing conditions.

5. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions.

1.2 QUALITY ASSURANCE

A. A geotechnical engineer will be retained by the Owner to observe performance of work in connection with excavating, trenching, filling, backfilling, and grading, and to perform compaction tests.

B. The Subcontractor shall readjust work performed that does not meet technical or design requirements, but make no deviation from the Contract Documents without specific and written approval from the Architect/Engineer.

END OF SECTION 023200

SECTION 024100 – SITE DEMOLITION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Building demolition excluding removal of hazardous materials and toxic substances.

B. Selective demolition of built site elements.

C. Abandonment and removal of existing utilities and utility structures.

D. Use precautionary measures to prevent subgrade issues and to avoid creating unsuitable soils as a result of construction activity.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 011000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

C. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 016000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

E. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of benchmarks, survey control points, and existing construction to remain; reinstallation of removed products.

1.03 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 - EXECUTION

2.01 SCOPE

A. Remove paving and curbs as required to accomplish new work.

B. Remove all other paving and curbs within site boundaries.

C. Within area of new construction, remove foundation walls and footings to a minimum of 2 feet below finished grade.

D. Outside area of new construction, remove foundation walls and footings to a minimum of 2 feet below finished grade.

E. Remove concrete slabs on grade within site boundaries.

F. Break up concrete slabs on grade within site boundaries to permit natural moisture drainage; leave pieces not larger than 1 square yard.

G. Remove underground tanks.

H. Remove underground tanks that contain or once contained petroleum products; fill and bury other types of tanks.

I. Remove manholes and manhole covers, curb inlets and catch basins.

J. Remove fences and gates.

K. Remove other items indicated, for salvage, relocation, and recycling.

L. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

M. Contractor shall prepare and submit to the Owner a sequencing plan for demolition.

N. Remove portions of existing building per sequence plan prepared by the Contractor.

O. All demolition debris shall be hauled off-site and properly disposed of.

2.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required local, state, federal and EPA required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   6. Do not close or obstruct roadways or sidewalks without permit.
   7. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

D. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

E. Underground Storage Tanks: Remove and dispose of as specified in Section 026500.

2.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

2.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 in locations indicated on drawings.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

2.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site and legally dispose of them off Owner's property. All disposal and removal shall be in accordance with all applicable local, state, federal and EPA regulations and requirements.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 024100

SECTION 024116 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of portions of buildings.
2. Abandoning in-place below-grade construction.
3. Disconnecting, capping or sealing, and abandoning in-place removing site utilities.
4. Salvaging items for reuse by Owner.

B. Related Requirements:

1. Section 011000 "Summary" for use of the premises and phasing requirements.
2. Section 013200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
3. Section 024119 "Selective Demolition" for partial demolition of buildings, structures, and site improvements.
4. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse. Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be demolished.
2. Review structural load limitations of existing structures.
3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review and finalize protection requirements.
5. Review procedures for noise control and dust control.
6. Review procedures for protection of adjacent buildings.
7. Review items to be salvaged and returned to Owner.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain including means of egress from those buildings.

D. Schedule of Building Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.
2. Temporary interruption of utility services.
3. Shutoff and capping or re-routing of utility services.

E. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before the Work begins.

1.7 FIELD CONDITIONS

A. Buildings portion to be demolished will be vacated and their use discontinued before start of the Work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.

1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.

a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before building demolition, Owner will remove the following items:

a. Kitchen Equipment. Any kitchen equipment items remaining upon mobilization is the property of the contractor to properly dispose or recycle.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. On-site storage or sale of removed items or materials is not permitted.

1.8 COORDINATION

A. Arrange demolition schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied buildings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of all authorities having jurisdiction. This includes all local, state and federal authorities.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

2.2 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

F. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

B. Salvaged Items: Comply with the following:

1. Store items in a secure area until delivery to Owner.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.

1. Arrange to shut off utilities with utility companies.
2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
3. Cut off pipe or conduit a minimum of 2’-0” below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
4. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of demolition.

C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
    a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.

D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."

1. Protect adjacent buildings and facilities from damage due to demolition activities.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.5 DEMOLITION, GENERAL

A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain fire watch during and for at least 2 hours after flame-cutting operations.
3. Maintain adequate ventilation when using cutting torches.
4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Explosives: Use of explosives is not permitted.

3.6 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Salvage: Items to be removed and salvaged are indicated on Drawings.

D. Below-Grade Construction: Demolish foundation walls and other below-grade construction that are within footprint of new construction and extending 5 feet outside footprint indicated for new construction. Abandon below-grade construction outside this area.

1. Remove below-grade construction, including basements, foundation walls, and footings, to depths indicated.

E. Existing Utilities: Abandon existing utilities and below-grade utility structures. Cut utilities flush with grade.

F. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within 5 feet outside footprint indicated for new construction. Abandon utilities outside this area.

1. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."

G. Hydraulic Elevator Systems: Demolish and remove elevator system, including cylinder, plunger, well assembly, steel well casing and liner, oil supply lines, and tanks.

3.7 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."

C. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.8 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction, including local, state, federal and EPA required permits.

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.10 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

1. Clean roadways of debris caused by debris transport.

END OF SECTION 024116

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.
3. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

C. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and, for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's and other tenants' on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

1.7 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction, including local, state, federal and EPA required permits.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and preconstruction videotapes.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Equipment to Be Removed: Disconnect and cap services and remove equipment.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weather-tight. See Section 075423 "Thermoplastic Polyolefin (TPO) Roofing " for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to wood deck substrate.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in a landfill compliant with local, state and federal authorities.

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 033000 - CONCRETE WORK

PART 1 - GENERAL

1. Related Documents:

    A. Drawings and general provisions of Contract, including General and Supplementary Condition apply to work of this section.

2. Description of Work:

    A. The extent of concrete work shown on drawings.

    B. Concrete paving and walks are specified in Division 2

3. Quality Assurance:

    A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified.

        1. ACI 301 "Specifications for Structural Concrete ".

        2. ACI 318 "Building Code Requirements for Reinforced Concrete".

        3. ACI 117 “Standard Specifications for Tolerances for Concrete Construction and Materials.”

        4. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

    B. Concrete Testing Service: Employ, at Contractor's expense a testing laboratory acceptable to Architect to perform material evaluation tests, field cylinder tests and to design concrete mixes.

    C. Materials and installed work may require testing and retesting, as directed by Architect, at anytime during progress of work. Allow free access to material stockpiles and facilities. Tests, not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

4. Submittals:

    A. Product Data: Submit manufacturer’s product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Architect.

    B. Shop Drawings; Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required and openings through concrete structures.

    C. Samples: Submit samples of materials as specified and as otherwise requested by Architect, including names, sources and descriptions.

    D. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test as specified.

    E. Material Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by Architect. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

PART 2 - PRODUCTS

1. Form Materials:

   A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

      1. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled an edge-sealed, with each piece bearing legible inspection trademark.

   B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. All lumber used must be dressed on at least 2 edges and one side to insure a tight fit.

   C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will impair subsequent treatments of concrete surfaces.

2. Reinforcing Materials:

   A. Reinforcing Bars (Rebar): ANSI/ASTM A 615, Grade 60, deformed.

   B. Steel Wire: ANSI/ASTM A 82, plain, cold-drawn, steel.

   C. Welded Wire Fabric (WWF): ASTM A 185, welded steel wire fabric (flat sheets).

   D. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations, unless otherwise acceptable.

   E. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

3. Concrete Materials:

   A. Portland Cement: ANSI/ASTM C 150, Type I, unless otherwise acceptable to Architect.

   B. Use one brand of cement throughout project, unless otherwise acceptable to Architect.

   C. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates form a single source for exposed concrete.

   D. Water: Potable.

   E. Air-Entraining Admixture: ASTM C 260.

   F. Calcium chloride not permitted.

   G. Mid-Range Water-Reducing Admixture: ASTM C494 Type A

4. Related Materials:

A. Moisture Barrier: Provide moisture barrier cover over prepared base material for all slabs on grade. Use only materials with a permeance rating of less than 0.1 Perms when tested in accordance with ASTM E154, as follows:

1. Refer to Specification Section 07 26 00 -UNDER-SLAB VAPOR RETARDER

B. Chemical Hardener: Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 lbs. of fluosilicates per gal.

C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

D. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.

1. Waterproof paper.

2. Polyethylene film.

3. Polyethylene-coated burlap.

E. Liquid Membrane-Forming Curing Compound: ASTM C 1315, Type 1, Class A.

1. Provide a curing compound compatible with floor sealers and floor finishes in areas to receive sealer and finishes. See Division 9 and room finish schedule for type of floor sealer and finishes.

F. Expansion Joint Material:

1. Type F by Sonneborn for exterior slab conditions.
2. Self-adhesive “VYCORE” by W.R. Grace(or approved equal) for all interior slab locations.

5. Proportioning and Design of Mixes:

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.

C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules.

1. 3500 psi 28-day compressive strength; 520 lbs. cement per cu. yd. minimum; W/C ratio, 0.45 max for interior slabs and 0.46 max for all other concrete. Flyash substitution is only permitted in the slabs with a 15% maximum content. Flyash substitution is <u>not permitted in the foundations</u>.
2. Lean Concrete Fill under foundations (where required): 1500 psi 28-day compressive strength.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and

accepted by Architect before using in work.

E. Admixtures:

1. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content within following limits:

a. Concrete structures and slabs exposed to freezing and thawing or subjected to hydraulic pressure:

3% to 5% for maximum 1" aggregate.

b. Other Concrete:

2% to 4% air.

F. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows(these values can be exceeded by use of water-reducer, but ranges required before addition of water-reducer):

1. Ramps and sloping surfaces: Not more than 3".

2. Reinforced foundation systems: Not less than 1" and not more than 5".

3. Other concrete: Not less than 1" and not more than 5".

6. Concrete Mixes:

A. Job-Site Mixing: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one cu. yd., or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cu. yd., or fraction thereof.

B. Provide batch ticket for each batch discharges and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

C. Ready Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.

1. Delete references for allowing additional water to be added to batch for material with insufficient slump. Addition of water to the batch will not be permitted.

D. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

1. When air temperature is between 85 degrees (F) and 90 degrees (F), reduce mixing and delivery time for 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees (F), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

1. Forms:

   A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

   B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

   C. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

   D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

   E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

   F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

   G. Form Ties: Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

      1. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least 1-1/2" inside concrete.

      2. Unless otherwise shown, provide form ties which will not leave holes larger than 1" diameter in concrete surface.

   H. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

   I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

2. Placing Reinforcement:

   A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

   B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3. Joints:

A. Construction Joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Architect.

B. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.

C. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.

D. Control Joints: Saw cut joints as shown on the drawings. Joints to be sawn as soon as concrete is set sufficiently, but must be sawn the same day as the concrete is poured.

4. Installation of Embedded Items:

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

5. Preparation of Form Surfaces:

A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturers instructions.

C. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

6. Concrete Placement:

A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work.

Moisten wood forms immediately before placing concrete form coatings are not used.

B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

C. General: Comply with ACI 304, and as herein specified. Deposit concrete continuously or in layers of such thickness that no concrete will placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

E. Consolidate placed concrete by mechanical vibrating equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

F. Do not use vibrators to transport concrete inside form. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

G. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

H. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

I. Bring slab surfaces to correct level with straightedge and strikeoff. All interior slabs shall pitch to floor drains (if drains are indicated on Architectural or Mechanical or Structural Drawings). All exterior slabs shall drain away from the building and shall not pond any water. Do not set screeds off metal deck setting on steel beams. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

J. Maintain reinforcing in proper position during concrete placement operations.

K. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

L. When air temperature has fallen to or is expected to fall below 40 degrees (F), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees (F), and not more than 80 degrees (F) at point of placement.

M. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

N. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs. Non-chloride accelerators may be used if submitted and approved in the design mix.

O. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

P. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees (F). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.

Q. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

R. Wet forms thoroughly before placing concrete.

S. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or their adverse placing conditions.

7. Finish of Formed Surfaces:

A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chopped off.

B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Smooth Rubbed Finish: Provide smooth rubbed finish to exposed concrete surfaces, which have received smooth form finish treatment, not later than one day after form removal.

D. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

E. Related Uniformed Surfaces: At tops of walls, horizontal offsets surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

F. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, paint or other thin film finish coating system. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8" in 10' when tested with a 10' straightedge. Grind smooth surface defects which would telegraph through applied floor covering system. If interior floor slab is “burnt / shiny”, the slab shall be sanded, abraded, and in severe cases might require beed blast

G. Chemical-Hardener Finish: Apply chemical-hardener finish to interior concrete floors where indicated by the Architect on the Room Finish Schedule. Apply liquid chemical-hardener after complete curing and drying of the concrete surface. Dilute liquid hardener with water, and apply in 3 coats; first coat, 1/3-strength; second coat, 1/2-strength; third coat, 2/3-strength. Evenly apply each coat, and allow 24 hours for drying between coats.

1. Apply proprietary chemical hardeners, in accordance with manufacturer's printed instructions.

2. After final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

8. Concrete Curing and Protection:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

C. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

D. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound (only with specific approval for interior slabs), and by combinations thereof, as herein specified.

E. Provide moisture curing by following methods.

1. Keep concrete surface continuously wet by covering water.

2. Continuous water-fog spray.

3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

F. Provide moisture-cover curing as follows: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

G. Provide curing compound to slabs as follows (only permitted by special approval):

1. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuously operation by powerspray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during period.

2. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to Architect. Coordinate with specified finishes and verify before application.

H. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period of until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

I. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing compound.

J. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

K. All control and expansion joints shall be cleaned and filled with a self-leveling sealant that complies to ASTM C-920 and applied according to the manufacturers recommendations. The sealant shall be one of the following or an approved equal:
    1) Sika - Sikaflex - 2c SL
    2) Sonneborn - Sonolastic SL 1

9. Removal of Forms:

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of this work, may be removed after cumulatively curing at not less than 50 degrees (F) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28 days. Determine potential compressive strength of in place concrete by testing field-cured specimens representative of concrete location or members.

C. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

10. Re-use of Forms:

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

11. Inspection:

Concrete shall not be placed over pipes, conduits, etc. until such work has been tested, inspected and approved. No concrete shall be deposited until the Architect has inspected the forms and placing of steel reinforcement and given permission to place concrete.

12. Notifying Other Trades:

This Contractor shall notify the Mechanical and Electrical Contractors, and all other Contractors, at the proper time to install all conduits, pipes, pipe sleeves, anchors, or other equipment coming under their respective contracts in the form work.

13. Miscellaneous Concrete Items:

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

14. Concrete Surface Repairs:

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.

B. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

C. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

D. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

E. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

F. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

G. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.

H. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

I. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.

J. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all round. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

K. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in area continuously moist for not less than 72 hours.

L. Use epoxy-based mortar for structural repairs, where directed by Architect.

M. Repair methods not specified above may be used, subject to acceptance of Architect.

15. Quality Control Testing During Construction:

A. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

1. Slump: ASTM C 143; one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

2. Air content: ASTM C 173; volumetric method for light-weight or normal weight concrete; ASTM C 231 pressure for normal weight concrete; one for each set of compressive strength test specimens.

3. Concrete Temperature: Test hourly when air temperature is 40 degrees (F) and below, and when 80 degrees (F) and above; and each time a set of compression test specimens made.

4. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

5. Compressive Strength Tests: ASTM C 39; one set for each 100 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5000 sq. ft. of surface area placed; 1 specimen tested at 7 days, 2 specimen tested at 28 days, and one specimen retained in reserve for later testing if required.

6. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

7. When total quantity of a given class of concrete is less than 50 cu. yds., strength test may be waived by Architect if, in his judgement, adequate evidence of satisfactory strength is provided.

8. When strength of field-cured cylinders is less than 85 % of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

9. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive by more than 500 psi.

B. Test results will be reported in writing to Architect, Structural Engineer, Owner, and Contractor on same day that tests are made. Reports of compressive strength test shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

C. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such test required, when unacceptable concrete is verified.

END OF SECTION 033000

Concrete Mix Design Submittal Form

Project Information:

Project Name: Legrande Elementary School Addition and Renovation

Project Location: Hart County; Munfordville, Kentucky

Submittal Date: _____

General Contractor: _____

Project Superintendent: _____

Job Site Telephone Number: _____

Concrete Supplier: _____

Technical Contact: _____

E-mail Address: _____

Telephone Number: _____

Batch Plant Location: _____
(City, State)

Travel Distance: _____
(Batch Plant to Project Site)

Concrete Mix Information:

Concrete Mix Design Designation: _____
(As indicated on Concrete Batch Ticket)

Concrete Use: _____
(As indicated in the Project Specifications)

Minimum Concrete Compressive Strength, f'_c: _____ psi @ _____days

Normal-Weight Concrete: _____

Light-Weight Concrete: _____ Specified Concrete Weight: _____ pcf

Required Air Content: _____ %

Concrete Placement Method: (Specify One placement method for each Mix Design)

Bucket _____ , Pump _____, Chute _____, Tremie _____ ,

Other _____ Specify _____

Method of Mix Design Preparation:

Field Experience Method: _____ (Submit supporting Statistical Analysis)

Trial Mixture Method: _____ (Submit supporting Test Data)

The Concrete Mix Design Proportioning Method shall be selected and executed in accordance with ACI 318-02.

Portland Cement:

Manufacturer: _____

ASTM No. _____, Type: _____

Low-Alkali: ____ Yes ____ No

Submit Material Certificates signed by manufacturer certifying that the Portland Cement proposed for use in this mix complies with the specification requirements.

Fly Ash: USE FLY ASH ONLY WHEN APPROVED BY THE ENGINEER.

Manufacturer: _____

ASTM No. _____, Type: _____

Submit Material Certificates signed by manufacturer certifying that the Fly Ash proposed for use in this mix complies with the specification requirements.

Aggregates - General:

Combined Aggregate Gradation: Aggregates shall be well graded form coarsest to finest with not more than 18-percent and not less than 8-percent retained on an individual sieve, except that less than 8-percent may be retained on the coarsest sieve, and less than 8-percent may be retained on No. 50 sieve (and on sieves finer than No. 50). Submit supporting sieve analysis to verify that Combined Aggregate Gradation meets this requirement.

Coarse Aggregate:

Supplier: _____

Type: _____ Maximum Size: _____

Oven Dry Density: _____ pcf Absorption: _____ %
(Moisture Content at SSD condition)

Submit Material Certificates signed by supplier certifying that Coarse Aggregates proposed for use in this mix comply with the requirements of ASTM C33.

Fine Aggregate:

Supplier: _____

Type: _____ Fineness Modulus: _____

Oven Dry Density: _____ pcf Absorption: _____ %
(Moisture Content at SSD condition)

Submit Material Certificates signed by supplier certifying that Fine Aggregates proposed for use in this mix comply with the requirements of ASTM C33.

Lightweight Aggregate: (When Specified)

Manufacturer: _____

Type: _____ Maximum Size: _____

Oven Dry Density: _____ pcf Absorption: _____ %
(Moisture Content at SSD condition)

Submit Material Certificates signed by manufacturer certifying that Lightweight Aggregates proposed for use in this mix comply with the requirements of ASTM C330.

CHEMICAL ADMIXTURES -

Note: Specify all types and combinations of admixtures anticipated to be used in this mix. Submit separate designs when a mix is to be modified or adjusted for weather conditions or other job site factors. Explain in Comments below.

Air Entraining Agent: (AEA)

Manufacturer: _____

Product Name: _____ ASTM No. _____

Water Reducer - Plain: (WR - Plain)

Manufacturer: _____

Product Name: _____ ASTM No. _____

Water Reducer with Set Accelerator: (WR w/ Acc.)

Manufacturer: _____

Product Name: _____ ASTM No. _____

Water Reducer with Set Retarder: (WR w/ Ret.)

Manufacturer: _____

Product Name: _____ ASTM No. _____

Set Accelerator:

Manufacturer: _____

Product Name: _____ ASTM No. _____

Set Retarder:

Manufacturer: _____

Product Name: _____ ASTM No. _____

High-Range Water Reducer - Plain: (HRWR -Plain)

Manufacturer: _____

Product Name: _____ ASTM No. _____

High-Range Water Reducer with Set Retarder: (HRWR -w/ Ret.)

Manufacturer: _____

Product Name: _____ ASTM No. _____

Comments Regarding Chemical Admixture Use in this Mix Design:

_____

_____

_____

_____

_____

_____

_____

_____

Concrete Mix Design Submittal Form

Mix Proportions: (Per Cubic Yard)

	Weight	Volume
Cement -	_____ lbs.	_____ cu. ft.
Fly Ash -	_____ lbs.	_____ cu. ft.
Coarse Agg. -	_____ lbs.	_____ cu. ft.
Fine Agg. -	_____ lbs.	_____ cu. ft.
Lightweight Agg. -	_____ lbs.	_____ cu. ft.
Water - (Including free water on aggregates)	_____ lbs.	_____ cu. ft.

Other _____
(Specify Material and units of measure)

Admixtures - Indicate whether Admixture is to be added at Batch Plant (BP) or Site

AEA -	_____ oz. / 100# cement	____ BP ____ Site
WR - Plain -	_____ oz. / 100# cement	____ BP ____ Site
WR w/ Acc. -	_____ oz. / 100# cement	____ BP ____ Site
WR w/ Ret. -	_____ oz. / 100# cement	____ BP ____ Site
Set Accelerator -	_____ oz. / 100# cement	____ BP ____ Site
Set Retarder -	_____ oz. / 100# cement	____ BP ____ Site
HRWR - Plain -	_____ oz. / 100# cement	____ BP ____ Site
HRWR w/ Ret. -	_____ oz. / 100# cement	____ BP ____ Site

Mix Design Characteristics:

Fly Ash Content - (Fly Ash Wt.) / (Fly Ash Wt. + Cement Wt.) = _____ %
(Must be equal to or less than 25%)

W/C Ratio - (Water Wt.) / (Fly Ash Wt. + Cement Wt.) = _____
(Water weight includes free water on aggregates)

(Fine Aggregate Wt.) / (Total Aggregate Wt.) = _____

Concrete Mix Design Submittal Form

Concrete Density -

Unit Weight (Wet) = _____ pcf

Unit Weight (Dry) = _____ pcf

Air Content: _____ %

Anticipated Slump -

Initial Slump = _____ in. (Before adding WR or HRWR)

Final Slump = _____ in. (After adding WR or HRWR)

Mix Design Prepared By: _____
(Typed / Printed Name)

_____
(Signature)

Chloride Ion Content -

The Concrete Producer certifies that the total chloride ion content of this concrete mix, as tested in accordance with ASTM C1218, does not exceed the amounts specified in Table 4.4.1 of ACI 318-02.

Alkali Content -

The Concrete Producer certifies that the total alkali content contributed from cementitious materials does not exceed 4.0 lbs / cu. yd. of concrete or certifies that the aggregate contains no deleterious material that may react with alkalis in the concrete mix.

Certified By: _____
(Authorized Representative of Concrete Supplier - Typed / Printed Name)

_____
(Signature)

Concrete Installer Qualifications Form

Project Information:

Project Name: Legrande Elementary School Addition and Renovation

Project Location: Hart County: Munfordville, Kentucky

Submittal Date: _____

General Contractor: _____

Project Superintendent: _____

Job Site Telephone Number: _____

Concrete Installer:

Company Name: _____

Company Address: _____

_____

Contact: _____

Telephone Number: _____

Concrete Installer Qualifications:

The Concrete Installer has experience in completing concrete work on projects similar to this project in size and scope and demonstrated by at least five (5) previous projects. List five (5) successful projects completed by the Concrete Installer. Provide Project Name, Location, and the Name and Telephone Number of the Owner's Representative for each Project.

1. _____

2. _____

3. _____

4. _____

5. _____

The Concrete Installer's Field Supervisor is certified under the ACI "Concrete Flatwork Finisher Training and Certification Program" _____ Yes _____ No

(If "No", the Field Supervisor for this project must have been the Field Supervisor on each at least three (3) of the projects listed above.)

Concrete Installer Qualifications Form

A "Responsible Officer" of the General Contractor's company shall sign this form below signifying that, to the best of the GC's knowledge, the information contained hereon is complete and accurate.

_____ _____

Signature of Responsible Officer Date

Typed / Printed Name of Responsible Officer: _____

Telephone Number: _____

Email Address: _____

Business Address: _____

_____

_____

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Face brick.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.
9. Salvage and installation of existing stone window sills.

B. Related Sections:

1. Section 033000 "Concrete Work" for installing dovetail slots for masonry anchors.
2. Section 051200 "Structural Steel" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
3. Section 055000 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
4. Section 071900 "Water Repellents" for water repellents applied to unit masonry.
5. Section 072100 “Thermal Insulation” for rigid cavity insulation.
6. Section 072119 ”Foamed-In-Place Insulation” for spray foam insulation at cavity locations.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Clay Masonry Unit Test: For each type of unit required, according to ASTM C 67 for compressive strength.

2. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
3. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.

C. Samples for Initial Selection:

1. Face brick.
2. Colored mortar.
3. Weep holes/vents.
4. Calcium Silicate Units, in all finishes indicated in construction documents

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For exposed brick, include test report for efflorescence according to ASTM C 67.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for typical exterior wall in sizes noted in drawings, if not noted provide mockup panel, approximately 64 inches (1625.6 mm) long by 72 inches (1800 mm) high by full thickness, including face and backup wythes and accessories.

    a. Include a sealant-filled joint at least 16 inches (400 mm) long in exterior wall mockup.
    b. Include lower corner of window opening framed with stone trim at upper corner of exterior wall mockup. Make opening approximately 12 inches (300 mm) wide by 16 inches (400 mm) high.
    c. Include metal studs, sheathing, building wrap, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
    d. Mockup to include calcium silicate units, cast stone water table, cast stone heads and sills and their associated flashing.

3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
4. Protect accepted mockups from the elements with weather-resistant membrane.
5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

    a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide bullnose units for outside corners unless otherwise indicated.

B. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
2. Density Classification: Lightweight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

a. 4 inches (100 mm) nominal; 3-5/8 inches (92 mm) actual.
b. 6 inches (150 mm) nominal; 5-5/8 inches (143 mm) actual.
c. 8 inches (200 mm) nominal; 7-5/8 inches (194 mm) actual.
d. 12 inches (300 mm) nominal; 11-5/8 inches (295 mm) actual.

4. Shapes: Bullnose CMU shall be used at all outside corners U.N.O., refer to details for wall base conditions in contract documents.

2.3 CONCRETE and MASONRY LINTELS

A. General: Provide one of the following:

B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than CMUs.

C. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Face Brick: Facing brick complying with ASTM C 216.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Field Brick to be selected from full range within brick allowance

2. Grade: SW.
3. Type: FBX.
4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi (23.10 MPa).
5. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67.
6. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
7. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet (3 m) or shall have a history of successful use in Project's area.
8. Size (Actual Dimensions): 3-5/8 inches wide by 2-5/8 inches high by 7-5/8 inches long.
9. Application: Use where brick is exposed unless otherwise indicated.
10. Color and Texture: As selected by Architect.
11. Tooth-in masonry at infilled openings where exposed to view.

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C 91.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Essroc

b. Holcim (US) Inc.; Mortamix Masonry Cement.
c. Lafarge North America Inc.; Magnolia Masonry Cement.
d. Lehigh Cement Company; Lehigh Masonry Cement.
e. KOS Mortar

E. Masonry Cement: ASTM C 1329.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Lafarge North America Inc.; Magnolia Superbond Mortar Cement.

F. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C 404.

H. Cold-Weather Admixture: Non-chloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Euclid Chemical Company (The); Accelguard 80.
b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

I. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Mill- galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
5. Wire Size for Veneer Ties: 0.148-inch (3.77-mm) diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

D. Masonry Joint Reinforcement for Multi-Wythe Masonry:

1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches (100 mm) wide, plus 1 side rod at each wythe of masonry 4 inches (100 mm) wide or less.
2. Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face.
3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.7 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 641/A 641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
4. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.

1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches (50 mm) long may be used for masonry constructed from solid units.
2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm).
3. Wire: Fabricate from 1/4-inch-(6.35-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls unless otherwise indicated.

D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-(6.35-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch-(6.35-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.

E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 01.05-inch-(2.66-mm-) thick, steel sheet, galvanized after fabrication.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch-(6.35-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.

F. Rigid Anchors: Fabricate from steel bars bent to configuration indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

G. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over ICF or over sheathing to metal studs, and as follows:

a. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).

2. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187-inch-(4.76-mm-) diameter, hot-dip galvanized-steel wire unless otherwise indicated.
3. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section. (Basis of Design Hohmann & Bernard DW-10).

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Dayton Superior Corporation, Dur-O-Wal Division
2) Heckmann Building Products Inc.
3) Hohmann & Barnard, Inc.
4) Wire-Bond

2.8 MISCELLANEOUS ANCHORS

A. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch (0.86-mm), galvanized steel sheet.

2.9 EMBEDDED FLASHING MATERIALS

A. Flexible Flashing: Use the following unless otherwise indicated:

1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch (1.02 mm).

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Advanced Building Products Inc.; Peel-N-Seal.
2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.

3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier Thru-Wall Flashing.
4) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
5) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
6) Hohmann & Barnard, Inc.; Textroflash.
7) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
8) Polyguard Products, Inc.; Polyguard 300.
9) Sandell Manufacturing Co., Inc.; Sando-Seal.
10) Williams Products, Inc.; Everlastic MF-40.

b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use the following unless otherwise indicated:

1. Wicking Material: Absorbent rope, made from cotton, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity. Use only for weeps.
2. Aluminum Weep Hole/Vent: One-piece, L-shaped units made from sheet aluminum, designed to fit into a head joint and consisting of a vertical channel with louvers stamped in web and with a top flap to keep mortar out of the head joint; painted before installation to comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" in color selected by Architect.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Hohmann & Barnard, Inc.; #343W - Wilko Weep Hole.

E. Cavity Drainage Material: Semi-rigid polyethylene mesh panels, sized to the thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage. A mortar diverter out of 8" high panels designed for installation at flashing locations.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Advanced Building Products, Inc: www.advancedflashing.com.
b. Mortar Net USA, Ltd: www.mortarnet.com
c. Masonry Reinforcing Corporation of America: www.wirebond.com

F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.11 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned. Cleaner to be for Red and Light-Colored Brick, Not Subject to Metallic Staining with Mortar Not Subject to Bleaching.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Diedrich Technologies, Inc.
b. ProSoCo, Inc.

2.12 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime, masonry cement, or mortar cement mortar unless otherwise indicated.
3. For exterior masonry, use portland cement-lime, masonry cement, or mortar cement mortar.
4. For reinforced masonry, use portland cement-lime, masonry cement, or mortar cement mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type S.
3. For mortar parge coats, use Type N.
4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
5. For interior non-load-bearing partitions, Type O may be used instead of Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement.
c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement to allow for differential movement regardless of whether bed joints align.

2. Header Bonding: Provide masonry unit headers extending not less than 3 inches (76 mm) into each wythe. Space headers not over 8 inches (203 mm) clear horizontally and 16 inches (406 mm) clear vertically.
3. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Bond wythes of cavity walls together using bonding system indicated on Drawings.

C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity.

D. At masonry backup locations coat cavity face of backup wythe to comply with Section 071113 "Bituminous Dampproofing." Note, Dampproofing is not required at the ICF construction.

E. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 1 inch (25 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.9 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors to concrete and masonry backup, and to ICF, with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections in masonry joints. Provide not less than 2 inches (50 mm) of air space between back of masonry veneer and face of sheathing.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches (406 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally with not less than 1 anchor for each 3.5 sq. ft. (0.33 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (914 mm), around perimeter.

3.10 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in brick as follows:

1. Build flanges of factory-fabricated, expansion-joint units into masonry.
2. Build in compressible joint fillers where indicated.
3. Form open joint full depth of brick wythe and of width indicated, but not less than 1/2 inch (13 mm) for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealants," but not less than 3/8 inch (10 mm).

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.11 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

1. Use specifically formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Cure pre-cast lintels before handling and installing. Temporarily support built-in place lintels until cured.
2. If formed in-place lintels are used, contractor to comply with the requirements in Division 3- Concrete Work.

C. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches (200 mm), and through inner wythe to extend 1/2 inch (13 mm) beyond the face of wall in exposed masonry. Once Architect and Owner review installation, contractor to trim flashing back flush with face of masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches (50 mm) on interior face.
3. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches (200 mm); with upper edge tucked under building paper or building wrap, lapping at least 4 inches (100 mm).
4. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
5. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
3. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
4. Space weep holes formed from wicking material 16 inches (400 mm) o.c.
5. Trim wicking material flush with outside face of wall after mortar has set.

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

F. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.13 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Level 2 special inspections according to the "International Building Code."

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

J. WHERE MASONRY UNITS ARE EXPOSED TO VIEW, PROVISIONS WITHIN ASTM C 216, ASTM C 129, ASTM C 90, AND ASTM C 73 FOR FINISH AND APPEARANCE ARE SUBJECT TO ARCHITECT AND OWNER'S FINAL REVIEW AND ACCEPTANCE. SAMPLE MASONRY WALLS WILL BE FIELD SELECTED AND APPROVED AT VARIOUS STAGES OF CONSTRUCTION AND FINISHING, INCLUDING INTERIOR CMU WALLS. THE APPROVED MASONRY WALLS WILL BE SUBJECT TO COMPARISON TO THE APPROVED SAMPLE MASONRY WALLS. MASONRY WALLS NOT IN COMPLIANCE WITH THE REQUIREMENTS HEREIN ARE SUBJECT TO REMOVAL, REPLACEMENT, AND/ OR REPAIR. WHERE MASONRY WALLS ARE REJECTED, THE CONTRACTOR WILL SUBMIT REMEDIAL OPTIONS FOR REVIEW AND ACCEPTANCE TO THE OWNER AND ARCHITECT.

3.15 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
8. Clean stone trim to comply with stone supplier's written instructions.

3.16 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL

1. GENERAL:

   A. The general provisions of the Contract, including General and supplementary Conditions and General Requirements, apply to the work specified in this section.

2. RELATED WORK SPECIFIED ELSEWHERE:

   A. Grouting under base and bearing plates, Division 3.

3. FURNISHED BUT INSTALLED ELSEWHERE:

   A. Anchor bolts, loose bearing plates, which will be installed under Division 3.

4. REQUIREMENTS FOR REGULATORY AGENCIES:

   A. AISC Specification Structural Steel for Building shall mean AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, adopted July 7, 2016.

   B. Specification for Structural joints shall mean "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts, approved by the Research Council on Riveted and Bolted Joints of the Engineered Foundation, August 1, 2014.

   C. AWS Building Code shall mean AWS "Code for Welding in Building Construction", DI.1-2007.

5. QUALIFICATIONS:

   A. **The supplier shall be the steel fabricator and the steel fabricator shall be AISC CATEGORY I plant certified, OR AWS SHOP CERTIFIED, OR** Employ an independent special inspection agency to verify the fabrication of all structural members. The cost of this shall be the sole responsibility of the Steel Fabricator. This inspection agency shall have AWS D1.1 qualifications, and be approved by the Engineer and Owner. The special inspection agency must submit reports of acceptance for all shop fabricated items as required in KBC-2018, sections 1704.2.5 and 1705.2. Any material sent to the site without a report of acceptance from the fabricator's special inspector will be inspected by the owner's special inspector. The cost of these additional tests will be deducted from the contractor's application for payment. If the lack of inspections from the fabricator persists, then owner's special inspector will be sent to the fabricator's shop daily to inspect all of the material for this project and the costs for these inspections will be deducted from the contractor's application for payment (NO EXCEPTIONS).

   B. Welding procedures, welders, welding operations and tackers shall be qualified in accordance with AWS Building Code.

6. SUBMITTALS:

   A. Shop Drawings:

      1. Submit shop drawings indicating all shop and erection details, including cuts, copes, connection, holes, threaded fasteners and welds.

      2. All welds, both shop and field shall be indicated by AWS "Welding Symbols" A2.0-68.

   B. Erection Procedure: Submit descriptive data to illustrate the structural steel erection procedure, including the sequence of erection and temporary staying and bracing.

   C. Welding Procedure: Submit written description as required to illustrate each welding procedure to be performed in the specified work.

   D. Field Welding Equipment: Submit descriptive data for field welding equipment, including

type, voltage and amperage.

E. Reports of mechanical tests for high strength threaded fasteners.

7. PRODUCT HANDLING:

A. Delivery of materials to be installed under other sections:

1. Anchor bolts and other anchorage devices which are embedded in cast-in-place concrete or masonry construction shall be delivered to the project site in time to be installed before the start of cast-in-place concrete operations or masonry work.

2. Provide setting drawings, templates, and directions for the installation of the anchor bolts and other devices.

B. Storage of Materials:

1. Structural steel members which are stored at the project site shall be above ground on platforms, skids or other supports.

2. Steel shall be protected from corrosion.

3. Other materials shall be stored in a weathertight and dry place, until ready for use in the work.

4. Packaged materials shall be stored in their original unbroken package or container.

8. MATERIALS:

A. Steel Shapes, Bars, and Plates:

1. ASTM A992 (all W-shapes)

2. ASTM A 36.(all bars, plates, channels)

3. ASTM A 500, Grade B (Tube Columns).

4. ASTM A 53, Grade B (Pipe Columns).

B. Structural steel, fabrication and erection shall comply with the American Institute of Steel Construction, Specifications for the Design, Fabrication and Erection of Structural Steel for Building.

C. Anchor Bolts: Conform to Section 1C of ASTM A 307-68.

D. High-Strength Threaded Fasteners: ASTM A 325, **Torque Control** (Tension Set) bolts.

E. Filler Metals for Welding:

1. Shielded metal-arc welding: AWS A5.1, E70 Electrodes.

2. Submerged arc welding: AWS A5.17.

F. Shop Paint Primer:

1. Standard Primer: SSPC Paint System Guide No. 7.00.

G. All bolted connections shall be of high strength bolts conforming to ASTM A 325 and shall be bearing type with threads excluded from shear plane.

H. All structural steel shall be accurately set and properly secured in place. Field connections of steel work shall be welded or bolted with high strength bolts, size as called for on the drawings. Connections shall be as detailed. All welding to be done by certified welders with at least five years experience in structural welding, and in a neat workmanlike manner.

9. FABRICATION:

A. Fabricate Structural Steel in accordance with the AISC Specification with the modifications and additional requirements specified in this section:

1. Shop and field welding shall conform to AWS and AISC Standards and Specifications.

2. Flame cutting of steel will not be permitted.

B. Shop connections shall be welded.

C. Field Connections:

1. Provide bolted, except where welded connections are indicated.

2. High strength threaded fasteners shall be used for bolted connections, except where standard threaded fasteners are permitted.

D. High-Strength Bolted Construction Assembly:

1. Tightening shall be done in accordance with Section 5 of AISC-Specifications for Structural Joints. All bolts shall have 28,000 pounds of tension (330 ft*lbs torque) applied.

E. Welded Construction:

1. Welding process shall be limited to one or a combination of the following:

a. Manual shielded-arc

b. Submerged arc.

c. Studs to be welded with automatically timed welding equipment.

F. Column Bases shall be milled and attached to columns.

G. Shop Painting:

1. Shop paint all steelwork. All steel on site must be primed.

2. Steelwork to be painted shall receive a one-coat shop paint system in accordance with SSPC Paint System PS 7.01 Paint 14-64T.

3. Steel components are not to be labeled with permanent markings. All markings on the steel shall be primed and painted to match adjacent steel.

10. ERECTION:

A. Erect structural steel in accordance with the AISC Specifications with modifications and additional requirements of this section:

B. Column Bases and Bearing Plates:

1. Attached column bases and bearing plates for beams and similar structural members shall be aligned with wedges or shims.

2. Loose column bases and bearing plates which are too heavy to be placed without a

derrick or crane shall be set and wedged or shimmed.

C. Erection Tolerances:

1. Individual pieces shall be erected so that the deviation from plumb, level and alignment shall not exceed 1 to 500.

D. Field Assembly:

1. Structural steel frames shall be accurately assembled to the lines and elevations indicated, within the specified erection tolerances.

2. The various members forming parts of a complete frame or structure after being assembled shall be aligned and adjusted accurately before being fastened.

3. Fastening of splices of compression members shall be done after the abutting surfaces have been brought completely into contact.

4. Bearing surfaces and surfaces which will be in permanent contact shall be cleaned before the members are assembled.

5. Splices shall be permitted only where indicated.

6. Field connections, field welds, and shear connectors shall be as specified in "Fabrication".

7. Erection bolts used in welded construction shall be tightened and left in place.

E. Gas Cutting: Field correcting of fabrication by gas cutting shall not be permitted on any major member in the structural framing without prior approval of the Architect.

11. TOUCH-UP PAINTING:

A. Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint, and paint all exposed areas with the same material as used for shop painting. Apply brush or spray to provide a minimum dry film thickness of 2.0 mils.

END OF SECTION 051200

SECTION 052100- STEEL JOISTS

1. GENERAL:

   A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to work specified in this section

2. DESCRIPTION OF WORK:

   A. The extent of steel joists is shown on the drawings, including basic layout and type of joists required.

3. QUALITY ASSURANCE:

   A. Provide joists fabricated in compliance with the following, and as herein specified.

      1. AISC-SJI "Standard Specifications and Load Tables for:

         K-Series Open Web Steel Joists.
         LH-Series Open Web Steel Joists.
         Joist Girders

   B. Qualify welding processes and welding operators in accordance with the AWS "Standard Qualification Procedure.

   C. Joists welded in place are subject to inspection and testing. Expense of removing and replacing any portion of the steel joists for testing purposes will be borne by the Owner if welds are found to be satisfactory. Contractor shall remove and replace any work found to be defective and provide new acceptable work.

4. SUBMITTALS:

   A. For information only, submit 2 copies of manufacturer's specifications and installation instructions for each type of joist and its accessories. Include manufacturer's certification that the joists comply with AISC-SJI "Specifications". Indicate by transmittal form that a copy of each instruction has been distributed to the Erector.

   B. Submit detailed drawings showing layout of joist units, special conditions, jointing and accessories. Include the mark, number, type, location and spacing to joists and bridging.

5. DELIVERY, STORAGE AND HANDLING:

   A. Deliver, store and handle steel joists as recommended in AISC-SJI "Specifications". Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

6. MATERIALS:

   A. Steel: Comply with AISC-SJI "Specifications".

   B. Steel Prime Paint: Comply with AISC-SJI "Specifications" except asphalt type paint not permitted.

7. FABRICATION:

   A. Provide horizontal or diagonal type bridging for "open web" joists, comply with AISC-SJI "Specifications".

   B. Provide bridging anchors for ends of all bridging lines terminating at walls or beams.

   C. End Anchorage: Provide end anchorages to secure joists to adjacent construction,

complying with AISC-SJI "Specifications" unless otherwise noted.

D. Design roof joists for a net uplift loading of 15 p.s.f.

9. SHOP PAINTING:

A. Remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories before application of shop paint.

B. Apply one shop coat of steel joist primer paint to steel joists and accessories by spray, dipping or other method to provide a continuous dry paint film thickness of not less than 0.50 mils.

10. INSPECTION:

A. Erector must examine the areas and conditions under which steel joists are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Erector.

11. ERECTION:

A. Place and secure steel joists in accordance with AISC-SJI "Specifications", final shop drawings and as herein specified.

B. Furnish anchor bolts and other devices to be built into the concrete and masonry construction. Furnish templates for the accurate location of anchors in other work.

C. Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.

D. Provide temporary bridging, connections and anchors to ensure lateral stability during construction.

12. BRIDGING:

A. Install bridging simultaneously with joist erection, before any construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.

13. FASTENING JOISTS:

A. Field weld joists to supporting steel framework in accordance with AISC-SJI "Specifications" for the type of joist used. Coordinate welding sequence and procedure with the placing of joists.

14. TOUCH-UP PAINTING:

A. After joist installation, paint all field bolt heads and nuts, and welded areas, abraded or rusty surfaces on joists and steel supporting members. Wire brush surfaces and clean with solvent before painting. Use the same type of paint as used for shop painting.

END OF SECTION 052100

SECTION 053100 - METAL DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Roof deck.
2. Noncomposite form deck.
3. Composite floor deck.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for concrete fill.
2. Division 5 Section "Structural Steel" for shop- and field-welded shear connectors.
3. Division 5 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
4. Division 9 painting Sections for repair painting of primed deck.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: For each type of steel deck, signed by product manufacturer.

D. Welding certificates.

E. Research/Evaluation Reports: For steel deck.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

B. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.
2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

C. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

D. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1.6 COORDINATION

A. Coordinate installation of sound-absorbing insulation strips in topside ribs of acoustical deck with roofing installation specified in Division 7 to ensure protection of insulation strips against damage from effects of weather and other causes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Deck:

a. ASC Profiles, Inc.
b. Canam Steel Corp.;The Canam Manac Group.
c. Consolidated Systems, Inc.
d. DACS, Inc.
e. D-Mac Industries Inc.

f. Epic Metals Corporation.
g. Marlyn Steel Decks, Inc.
h. New Millennium Building Systems, LLC.
i. Nucor Corp.; Vulcraft Division.
j. Roof Deck, Inc.
k. United Steel Deck, Inc.
l. Valley Joist; Division of EBSCO Industries, Inc.
m. Verco Manufacturing Co.
n. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:

1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.

    a. Color: Manufacturer's standard.

2. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 coating.
3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

    a. Color: Manufacturer's standard.

4. Deck Profile:Type B, BA Accoustical WR, wide rib (see plan)
5. Profile Depth: 1-1/2 inches (see plans).
6. Design Uncoated-Steel Thickness: 22 GAGE.
7. Span Condition: Two Span (minimum).
8. Side Laps: Overlapped.

2.3 NON-COMPOSITE FORM DECK

A. Non-composite Steel Form Deck: Fabricate ribbed-steel sheet non-composite form-deck panels to comply with "SDI Specifications and Commentary for Non-composite Steel Form Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:

1. Uncoated Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum.

2. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, with top and underside surface shop primed with manufacturer's standard baked-on, rust-inhibitive primer.

   a. Color: Manufacturer's standard.

3. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade [33] G90 zinc coating.

   a. Color: Manufacturer's standard.

4. Profile Depth: 9/16 inch.
5. Design Uncoated-Steel Thickness: 26 GAGE.
6. Span Condition: Simple span.
7. Side Laps: Overlapped.

2.4 COMPOSITE FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 29, the minimum section properties indicated, and the following:
   1. Prime-Painted Steel Sheet: ASTM A 611, Grade **C** minimum, with top surface phosphatized and unpainted and bottom surface shop primed with gray or white baked-on, lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.
   2. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, **G60** zinc coating.
   3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 , G60 zinc coating; with unpainted top and bottom surface cleaned, pretreated, and primed with manufacturer's baked-on, lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.
   4. Profile Depth: **1-1/2 inches** .
   5. Design Uncoated-Steel Thickness: **As indicated.**
   6. Span Condition: **As indicated.**

2.5 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch [0.0747 inch] thick, with factory-punched hole of 3/8-inch minimum diameter.

J. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and [level] [sloped] recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

K. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

L. Galvanizing Repair Paint: [ASTM A 780] [SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight].

M. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten floor deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members using Mechanical fasteners as indicated in the plans. :

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the amounts indicated on the plans and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. mechanically fasten to substrate to provide a complete deck installation.

F. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified. In areas designated on plans the roof deck type BA acoustical shall be provided under this section and installed under the roofing specifications.

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch , nominal.
2. Weld Spacing: Space and locate welds as indicated.
3. Weld Washers: Install weld washers at each weld location for non-composite floor deck.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Fasten with a minimum of 1-1/2-inch- long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of [1-1/2 inches , with end joints as follows:

1. End Joints: Lapped.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Engineer.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Division 9 ."

D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Miscellaneous steel trim including steel edgings.
   2. Loose bearing and leveling plates for applications where they are not specified in other Sections.
   3. Galvanized steel ladder.

B. Products furnished, but not installed, under this Section include the following:

   1. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

   1. Division 3 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
   2. Division 4 Section "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
   3. Division 5 Section "Structural Steel Framing”.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

B. Provide Shop Drawings for the following:

   1. Steel framing and supports for countertops.

2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Steel and Aluminum Ladders
4. Industrial Stairs
5. Miscellaneous steel trim including steel edgings.
6. Metal bollards.
7. Metal downspout boots.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders. Shop drawing Submittal to include the Professional Engineer Stamp, licensed in the State of Kentucky.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

E. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

F. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

G. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

H. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

I. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.

J. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

K. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).

2.3 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting."

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

E. indicated on the drawings.

F. Powder Coat Finish – Factory.

2.6 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

2.7 REPRODUCTION CAST IRON GRILLES

A. 11-1/2” x 7-3/8” cast iron register with black finish by Van Dykes Restores (#204800). Secure into existing masonry opening. Provide galvanized steel brackets both sides to secure in-place. Apply sealant at bracket to secure masonry opening perimeter.

2.8 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

2.9 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.10 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.12 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges

and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting."

END OF SECTION 055000

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Wood blocking and nailers.
4. Plywood backing panels.

B. Related Requirements:

1. Section 061600 "Sheathing."

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NHLA: National Hardwood Lumber Association.
3. NLGA: National Lumber Grades Authority.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.

3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawl spaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat items indicated on Drawings, and the following:

1. Concealed blocking.
2. Roof framing and blocking.
3. Plywood backing panels.

2.4 DIMENSION LUMBER

A. Framing Members: Construction or No. 2 grade and any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
6. Eastern softwoods; NeLMA.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:

1. Mixed southern pine, No. 3 grade; SPIB.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber with 19 persent maximum moisture content of any species.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Metal Framing: ASTM C 954, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.8 METAL FRAMING ANCHORS

A. Hot-Dip Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for wood-preservative-treated lumber and where indicated.

2.9 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

E. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. Do not splice structural members between supports unless otherwise indicated.

G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.

H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.

I. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

J. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for plywood backing panels.
2. Section 072500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory.".

2.2 WOOD PANEL PRODUCTS

A. Plywood: DOC PS 1.

B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

C. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 WALL SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corporation; GlasRoc.
b. Georgia-Pacific Building Products; Dens-Glass Gold.
c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
d. United States Gypsum Company; Securock.

2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

2.6 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall and Roof Sheathing:

a. Nail to wood framing.
b. Screw to cold-formed metal framing.
c. Space panels 1/8 inch (3 mm) apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
3. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.
2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.
2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

SECTION 071110 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Cold-applied, asphalt emulsion dampproofing.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed bituminous dampproofing similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Single-Source Responsibility: Obtain primary dampproofing materials and primers from one source and by a single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

1.4 PROJECT CONDITIONS

A. Substrate: Proceed with dampproofing only after substrate construction and penetrating work have been completed.

B. Weather Limitations: Proceed with dampproofing only when existing and forecasted weather conditions will permit work to be performed according to manufacturer's recommendations and warranty requirements.

C. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

PART 2 - PRODUCTS

2.1 BITUMINOUS DAMPPROOFING

A. General: Provide products recommended by manufacturer for designated application.

1. Odor Elimination: For interior and concealed-in-wall uses, provide type of bituminous dampproofing material warranted by manufacturer to be substantially odor free after drying for 24 hours under normal conditions.

B. Cold-Applied, Asphalt Emulsion Dampproofing: Asphalt-based emulsions recommended by the manufacturer for dampproofing use when applied according to the manufacturer's instructions.

1. Emulsion-Based Asphalt Damp proofing:
   a. Fibrated Emulsion-Based Asphalt: Fibrated emulsion-based asphalt damp proofing shall be cold-applied type conforming to ASTM D 1227 Type IV, asbestos-free, manufactured of refined asphalt, emulsifiers and selected clay, fibrated with mineral fibers. For spray or brush application, emulsion shall contain a minimum of

59 percent solids by weight, 56 percent solids by volume. For trowel application, emulsion shall contain a minimum of 58 percent solids by weight, 55 percent solids by volume.

2.2 MISCELLANEOUS MATERIALS

A. Primer: Asphalt primer complying with ASTM D 41, for asphalt-based dampproofing.

B. Glass Fabric: Woven glass fabric, treated with asphalt, complying with ASTM D 1668, Type I.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.

B. Install accessories as recommended or required by prime materials manufacturer even though not shown.

C. Fill voids, seal joints, and apply bond breakers, if any, as recommended by prime materials manufacturer, with particular attention at construction joints.

D. Install separate flashings and corner protection stripping, as recommended by prime materials manufacturer, where indicated to precede application of dampproofing. Comply with details shown and with manufacturer's recommendations. Pay particular attention to requirements at building expansion joints, if any.

E. Prime substrate as recommended by prime materials manufacturer.

F. Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work by masking or otherwise protecting adjoining work.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's recommendations except where more stringent requirements are indicated and where Project conditions require extra precautions to ensure satisfactory performance of work.

B. Application: Apply dampproofing to the following surfaces.

1. Exterior surface of inside wythe of double-wythe, exterior masonry walls above grade, to prevent water-vapor penetration through the wall.

C. Cold-Applied Asphalt Dampproofing: Provide only emulsified asphalt materials.

D. Reinforcement: At changes in plane or where otherwise shown as "reinforced," install lapped course of glass fabric in first coat of dampproofing compound before it thickens.

3.3 COLD-APPLIED, ASPHALT EMULSION DAMPPROOFING

A. Spray Grade: Brush or spray apply a coat of asphalt emulsion dampproofing at a rate of 1.5 to 2.5 gal./100 sq. ft. (0.6 to 1 L/sq. m), depending on substrate texture, to produce a uniform, dry-film thickness of not less than 15 mils (0.4 mm). Apply in 2 coats, if necessary, to obtain required thickness, allowing time for complete drying between coats.

3.4 PROTECTION AND CLEANING

A. Protect dampproofing membrane from damage. Remove overspray and spilled materials from surfaces not intended to receive dampproofing.

3.5 PROJECT WARRANTY

A. Submit a written warranty, executed by manufacturer agreeing to replace dampproofing that fails in materials or workmanship within the specified warranty period. This warranty shall be in addition to, and not a limitation of other rights the Owner may have against the Contract Documents.

1. Warranty Period: 5 years after date of substantial completion.

END OF SECTION 07115

SECTION 071326 – SELF-ADHERING SHEET WATERPROOFING SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Installation of sheet membrane waterproofing on surfaces indicated on drawings, consisting of preparation of existing and repaired concrete surfaces, sealing of cracks and joints, and application of Sheet Membrane Waterproofing.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete
B. Section 04 20 00 – Unit Masonry
C. Section 07 60 00 – Flashing and Sheet Metal
D. Section 07 90 00 - Caulking and Sealants

1.3 REFERENCES

A. ASTM D 3767 Standard Practice for Rubber—Measurement of Dimensions
B. ASTM D 412 Standard Test Method for Rubber Properties in Tension
C. ASTM D 882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting
D. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials
E. ASTM D 1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
F. ASTM C 836 Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
G. ASTM D 903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
H. ASTM D 1876 Standard Test Method for Peel Release of Adhesives (T-Peel)
I. ASTM E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
J. ASTM D 570 Standard Test Method for Water Absorption of Plastics
K. ASTM D 5385 Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
L. GSA-PBS 07121 Test for Decay from Soil Burial
M. UL 790 Tests for Fire Resistance of Roof Covering Materials

1.4 SYSTEM DESCRIPTION

A. Product provided by this Section is a self-adhesive membrane of not less than 60 mils thickness, consisting of 56 mils of rubberized asphalt membrane laminated to a 4-mil cross-laminated polyethylene film.

1.5 SUBMITTALS

A. General: Submit in accordance with Section 01 30 00.
B. Product Data: Submit manufacturer's product literature and installation instructions.
C. Subcontractor’s approval by Manufacturer: Submit document stating manufacturer's acceptance of subcontractor as an Approved Applicator for the specified materials.
D. Warranty: Submit a sample warranty identifying the terms and conditions stated in Section 1.7.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: Applicator shall have 5 years of experience in applying the same or similar materials and shall be specifically approved in writing by the membrane manufacturer.
B. Regulatory Requirements: Comply with applicable codes, regulations, ordinances, and laws regarding use and application of products that contain volatile organic compounds (VOC).
C. Pre-Application Conference: Prior to beginning work, convene a conference to review conditions, installation procedures, schedules and coordination with other work.

1.7 WARRANTY

A. Upon completion and acceptance of the work required by this section, the manufacturer will issue a warranty agreeing to promptly replace defective materials installed by an approved applicator for a period of 5 years.
B. The formation or presence of mold or fungi in a building is dependent upon a broad range offactors including, but not limited to, the presence of spores and nutrient sources, moisture, temperatures, climatic conditions, relative humidity, and heating/ventilating systems and their maintenance and operating capabilities. These factors are beyond the control of Carlisle and Carlisle shall not be responsible for any claims, repairs, restoration, or damages relating to the presence of any irritants, contaminants, vapors, fumes, molds, fungi, bacteria, spores, mycotoxins, or the like in any building or in the air, land, or water serving the building.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original, factory-sealed, unopened containers bearing manufacturer's name and label intact and legible with following information.

1. Name of material.
2. Manufacturer's stock number and date of manufacture.
3. Material safety data sheet.

B. Store materials in protected and well ventilated area. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with local applicable regulations.

1.9 PROJECT CONDITIONS

A. Do not apply membrane when surface temperature is below or inclement weather conditions conflict with manufacturer’s published requirements.
B. Coordinate waterproofing work with other trades. The applicator shall have sole right of access to the specified areas for the time needed to complete the installation.
C. Warn personnel against breathing of vapors and contact of material with skin or eyes. Wear applicable protective clothing and respiratory protection gear.
D. Keep flammable products away from spark or flame. Do not allow the use of spark producing equipment during application and until all vapors have dissipated. Post “NO SMOKING” signs.
E. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: CCW MiraDRI 860/861 Sheet Membrane Waterproofing as manufactured by Carlisle Coatings and Waterproofing Incorporated, or a comparable product by one of the following:

1. America Hydrotech, Inc.
2. CETCO, a Minerall Technologies Company
3. GCP Applied Technologies, Inc.
4. Henry Company
5. MAPEI Corporation
6. W. R. Meadows, inc.
7. York Manufacturing, Inc.

2.2 PRODUCTS

A. Self-Adhesive Sheet Membrane Waterproofing: Shall be 56 mil rubberized-asphalt membrane laminated to 4 mil cross-laminated polyethylene film, and shall meet or exceed the following requirements:

1. Thickness: 60 mils, ASTM D 3767
2. Tensile Strength (Membrane): 325 psi, ASTM D 412
3. Tensile Strength (Film): 5000 psi, ASTM D 882
4. Elongation: 350% minimum, ASTM D 412
5. Permeance: 0.05 Perm maximum, ASTM E 96
6. Flexibility, 180° bend over 1 in. mandrel at -45°F: Unaffected, ASTM D 1970
7. Crack Cycling at -25°F (100 cycles): Unaffected, ASTM C 836
8. Peel Strength: 10.0 lb/in, ASTM D 903
9. Lap Adhesion: 19.0 lb/in, ASTM D 1876
10. Puncture Resistance: 60 lb (min), ASTM E 154
11. Soil Burial 16 weeks: No Effect, GSA-PBS 07121
12. Water Absorption: 0.1% by wt., ASTM D 570
13. Hydrostatic Head: 230 ft., ASTM D 5385

B. For application temperatures between 15°F and 60°F, use CCW 861-ULT Sheet Membrane and CCW-702, CCW-702LV, or CCW-715. For application temperatures above 40°F use CCW MiraDRI 860/861sheet membrane and CCW-702, CCW-702LV, CCW-702WB, CCW-715, CCW-AWP, or Cav-Grip.

2.3 ACCESSORY PRODUCTS

A. Basis-of-Design: Carlisle Coatings and Waterproofing Incorporated (CCW) or approved equal for the following products:

1. Surface Primer: Shall be CCW 702 WB Water-Based Primer.
2. Mastic: Shall be CCW-704 Mastic.
3. Sealants: Shall be CCW-703 Vertical Grade Liquiseal Membrane, CCW-LM-800XL, CCW-201 two-component Polyurethane Sealant or approved sealant by CCW.
4. Backer Rod: Shall be closed-cell polyethylene foam rod.
5. Protection Course: Shall be CCW-Protection Board-H or HS, CCW-300HV for horizontal surfaces or CCW-Protection Board-V or CCW-200V for vertical surfaces.
6. Drainage Composite: Shall be CCW MiraDRAIN as recommended by the manufacturer for each condition.
7. Perimeter Drainage System: Where required shall be CCW MiraDRAIN HC.
8. Swellable Sealant: Shall be MiraSTOP SS for use in non-moving joints to create

watertight concrete joints and as an adhesive for CCW MiraSTOP waterstop strips

9. Pre-formed Bentonite hydrophilic waterstop strip: Shall be CCW MiraSTOP BW for use in non-moving joints to create watertight concrete joints
10. Pre-formed non-Bentonite hydrophilic waterstop strip: Shall be CCW MiraSTOP NBW for use in non-moving joints to create watertight concrete joints
11. Injectable waterstop (grout tube): Shall be MiraSTOP IW for use as an injectable waterstop for use in non-moving joints to create watertight concrete joints
12. Chemical grout: Shall be MiraSTOP CG-F and for use with the MiraSTOP IW
13. Miscellaneous products: accessory products approved by Carlisle Coatings & Waterproofing Inc.

PART 3 – EXECUTION

3.1 INSPECTION

A. Before any waterproofing work is started the waterproofing applicator shall thoroughly examine all surfaces for any deficiencies or unsatisfactory conditions detrimental to the proper completion of the work. Should any deficiencies exist, the architect, owner, or general contractor shall be notified in writing. Do not proceed with work until all deficiencies or unsatisfactory conditions are corrected.

3.2 SURFACE PREPARATION

A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing.

B. Cast-In-Place Concrete Substrates:

1. Do not proceed with installation until concrete has properly cured and dried (minimum 7 days for normal structural concrete and minimum 14 days for lightweight structural concrete).
2. Concrete shall be cured by water curing method. Any curing compounds must be of the pure sodium silicate type or clear resin-based materials without waxes, oils or pigments and be approved by the Carlisle representative.
3. Form release agents must not transfer to the concrete. Remove forms as soon as possible from below horizontal slabs to prevent entrapment of excess moisture. Excess moisture may lead to blistering of the membrane.
4. Concrete shall be sloped for proper drainage.
5. Voids, rock pockets and excessively rough surfaces shall be repaired with approved non- shrink grout or ground to match the unrepaired areas. Fill form tie rod holes with concrete and finish flush with surrounding surface.
6. Two-stage drains shall have a minimum 3 inch flange and be installed with the flange flush and level with the concrete surface.
7. Surfaces at cold joints shall be on the same plane. Grind irregular construction joints to suitable flush surface.

C. Masonry Substrates: Apply waterproofing over concrete block with smooth trowel-cut mortar joints or rough surfaces prepared with a parge coat.
Allow the parge coat to dry before priming and installing the CCW MiraDRI 860/861 waterproofing membrane.

D. Wood Substrates: Apply CCW MiraDRI 860/861 waterproofing membrane over securely fastened sound surface. All joints and fasteners shall be flush to create a smooth surface.

E. Related Materials: Treat joints and install flashing as recommended by waterproofing manufacturer.

3.3 APPLICATION

A. Refer to manufacturer's literature for recommendations on installation, including but not limited to, the following:

1. Apply primer/contact adhesive at rate recommended by manufacturer. Recoat areas which were not waterproofed the same day or if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of primer.
2. Do not install membrane until primer/contact adhesive is completely dry. Dry time will vary with weather conditions.
3. Seal installation at the end of the day with troweled bead of CCW-LM-800XL or CCW- 703V Liquiseal.
4. Apply protection board and/or MiraDRAIN and other related materials in accordance with manufacturer's recommendations.

3.4 INTEGRITY TESTING

A. Test is required for all expanded warranties beyond the standard material warranty of horizontal applications.

B. The test can be done with Electronic Vector Mapping or flood testing. Flood testing requires 2" minimum head of water for a period of 24 hours minimum.

3.5 PROTECTION COURSE

A. VERTICAL APPLICATION:
Install Drainage System as the first course of drainage composite immediately after membrane has been installed on vertical surfaces. Install Drainage Composite board on remainder. Stop drainage composite 6" below final grade level.

B. HORIZONTAL APPLICATION:
Install Drainage Composite board or Protection Board immediately after flood testing on horizontal surfaces. If flood testing is delayed, install a temporary covering to protect the membrane from damage by other trades.

END OF SECTION 071326

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.
2. Glass-fiber blanket insulation.
3. Mineral-wool blanket insulation.
4. Loose-fill insulation.

B. Related Sections:

1. Section 042000 "Unit Masonry" for insulation installed in cavity walls and masonry cells.
2. Section 061600 "Sheathing" for foam-plastic board sheathing over wood or steel framing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. DiversiFoam Products Dow: The Dow Chemical Company
    b. Kingspan Insulation.
    c. Owens Corning.

2. Type VI, 40 psi (276 kPa).

B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.2 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. CertainTeed Corporation.
2. Johns Manville; a Berkshire Hathaway company.
3. Owens Corning.
4. Knauf Insulation

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

D. Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

E. Mechanical Fasteners: Provide mechanical fasteners or tension clips to retain blanket insulation when not fully constrained by adjacent construction.

2.3 MINERAL-WOOL BLANKET INSULATION

A. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.4 LOOSE-FILL INSULATION

A. Glass-Fiber Loose-Fill Insulation: ASTM C 764, Type I for pneumatic application; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

2.5 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. AGM Industries, Inc; Series T TACTOO Insul-Hangers.
    b. Gemco; Spindle Type.

2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.

B. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. AGM Industries, Inc; TACTOO Adhesive.
    b. Gemco; Tuff Bond Hanger Adhesive.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical footing and foundation wall surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.

B. On horizontal surfaces under slabs, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in from exterior walls.

3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

D. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

E. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.5 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072600 -UNDER-SLAB VAPOR RETARDER

PART 1 – GENERAL

1.1 SUMMARY

A. Products supplied under this section:
   1. Vapor retarder, seam tape, and mastic for installation under concrete slabs.

B. Related sections:
   1. Section 03 Cast-in-Place Concrete

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E 1745-09 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
   2. ASTM E 154-99 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
   3. ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials.
   4. ASTM F 1249-06 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
   5. ASTM E 1643-09 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

B. American Concrete Institute (ACI):
   1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.3 SUBMITTALS

A. Quality control/assurance:
   1. Summary of test results as per paragraph 8.3 of ASTM E 1745.
   2. Manufacturer’s samples, literature.
   3. Manufacturer’s installation instructions for placement, seaming and penetration repair instructions.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Vapor retarder must have all of the following qualities:
   1. Permeance as tested before and after mandatory conditioning (ASTM E 1745 Section 7.1 and sub-paragraphs 7.1.1 - 7.1.5): less than 0.1 Perms [grains/(ft^2 · hr · inHg)].
   2. Other performance criteria:
      a. Strength: ASTM E 1745 Class A.

B. Provide one of the following Vapor retarder products:

   1. Stego Industries, LLC; Stego Wrap, 15 mil Class A
   2. Carlisle Coatings & Waterproofing, Inc.; Blackline 400
   3. Fortifiber Corporation; Moistop Ultra 15

4. Grace Construction Products, W. R. Grace & Company; Florprufe 120
5. Insulation Solutions, Inc; Viper Vaporcheck 16
6. Raven Industries, Inc.; Vapor Block 15
7. W. R. Meadows, Inc. ; Perminator 15 mil

2.2 ACCESSORIES

A. Vapor Retarding Seam tape must have the following qualities:
   1. Water Vapor Transmission Rate less than or equal to 0.3 perms as tested by ASTM E96
B. Vapor Proofing Mastic must have the following qualities:
   1. Water Vapor Transmission Rate less than or equal to 0.3 perms as tested by ASTM E96.

C. Pipe Boots must be constructed from vapor retarder material, pressure sensitive tape and/or mastic per vapor barrier system manufacture's instructions.

PART 3 – EXECUTION

3.1 PREPARATION

A. Ensure that subsoil is approved by Engineer or Special Inspector.
   1. Level and compact base material.

3.2 INSTALLATION

A. Install vapor retarder in accordance with manufacturer's instructions and ASTM E 1643.
   1. Unroll vapor retarder with the longest dimension parallel with the direction of the concrete placement.
   2. Lap vapor retarder over footings and/or seal to foundation walls.
   3. Overlap joints 6 inches and seal with manufacturer's tape.
   4. Seal all penetrations (including pipes) per manufacturer's instructions.
   5. No penetration of the vapor retarder is allowed except for reinforcing steel and permanent utilities.
   6. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.

END OF SECTION 072600

SECTION 074213.13 PREFORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section covers the pre-finished, pre-fabricated Architectural metal wall panel system. All metal trim, accessories, fasteners, insulation and sealants indicated on the drawings as part of this section.
B. Drawings and general provisions of the Contract, including general and Supplementary Conditions and Division 01 Specifications, apply to this section.

1.2 SUMMARY

A. Section Includes
    1. Factory formed metal wall panels
B. Related work specified elsewhere (Note: select from the below or add appropriate sections)
    1. Metal Roof Deck: Division 5 - Metal Deck Sections
    2. Wood Framing and Decking: Division 6 Roof Carpentry Section
    3. Flashing and Trim: Division 7- Flashing and Sheet Metal
    4. Coping and Gravel Stops: Division 7 Roof Specialties and Accessories
    5. Sealants: Division 7 Joint Sealers Sections

1.3 Definitions

A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal, and accessories necessary for a complete weathertight system.

1.4 QUALITY ASSURANCE

A. Manufacturer and erector shall demonstrate experience of a minimum of five (5) years in this type of project.
B. Sheet Metal Industry Standard: Comply with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) *Architectural Sheet Metal Manual.*
C. Panels shall be factory-produced only. No portable, installer-owned or installer-rented machines will be permitted.

1.5 SUBSTITUTIONS

A. The material, products and equipment specified in this section establish a standard for required function, dimension, appearance and quality to be met by any proposed substitution.

1.6 SYSTEM DESCRIPTION

A. Material to comply with:
    1. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

1.7 WALL PANEL SYSTEM PERFORMANCE TESTING

A. General Performance: Metal wall panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation or other defects in construction.
B. Panels to meet:
    1. Metal Wall or Metal Soffit System shall be designed to meet applicable Local Building Code and the Soffit System shall have been tested by the Manufacturer per ASTM E-330 and have the applicable Load Tables published from this Air Bag testing for negative loads.

1.8 WARRANTIES

A. Finish warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finish within specified warranty period.
    1. Exposed Panels Finish - deterioration includes the following:
        a. Color fading more than 5 hunter units when tested according to ASTM D 2244
        b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214
        c. Cracking, checking, peeling or failure of a paint to adhere to a bare metal.
    2. Warranty Period: 20 Years from the date of substantial completion
B. Applicator shall furnish written warranty for a two (2) year period from date of substantial completion of building covering repairs required to maintain roof and flashings in watertight condition

1.9 SUBMITTALS

A. Furnish detailed drawings showing profile and gauge of exterior sheets, location and type of fasteners, location, gauges, shape and method of attachment of all trim locations and types of sealants, and any other details as may be required for a weather-tight installation.
B. Provide finish samples of all colors specified.
C. Shop drawings: Show fabrication and installation layouts of metal wall panels or metal soffit panels, details of edge conditions, panel profiles, corners, anchorages, trim, flashings, closures and accessories, and special details. Distinguish between factory and field-assembled work
D. Coordination Drawings: Plans, drawn to scale, on which the following are shown and coordinated with each other, based on input from installer of the items involved.
E. Mockup Panel: Prior to product fabrication, owner to select finishes for the panels and review them installed in mockup panel installation. Mockup panel is to serve as level of quality for finish review, installation requirements and will remain onsite throughout construction of the project. Refer to drawings for sizes etc. of mockup panel.

1.10 DELIVERY, STORAGE AND HANDLING

A. Ordering: Comply with manufacturer's ordering instruction and lead time requirements to avoid construction delays.
B. Deliver components, sheets, metal wall panels and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
C. Unload, store and erect metal wall panels in a manner to prevent bending, warping, twisting and surface damage.
D. Stack metal wall panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness. Do not store metal wall panels in contact with other materials that might cause staining, denting or other surface damage.
E. Protect strippable protective coating on any metal coated product from exposure to sunlight and high humidity, except to the extent necessary for material installation.

1.11 PROJECT CONDITIONS

A. Weather Limitations: proceed with installation only when existing and forecasted weather conditions permit metal wall panel work to be performed.
B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PANEL DESIGN

A. General: Provide factory-formed metal wall panels designed for wall, soffit and fascia applications where a flush or flat appearance is desired. A round interlock leg and concealed fastening system act to improve the flush appearance while providing additional strength.
B. Wall panels shall be Flush Wall 12" widths with 1" height.
C. Panels to be produced with Pencil Rib - 1. Specifier note: Factory standard is smooth unless specified. Specifier Note: Depending on producing factory, panels may be specified with venting strips or perforated, aluminum panels only, for soffit applications. Check with local factory for capabilities.
D. Forming: Use continuous end rolling method. No end laps on panels. No portable roll-forming machines will be permitted on this project, no installer-owned or installer-rented machines will be permitted. It is the intent of the Architect to provide Factory-Manufactured panel systems only for this project.

2.2 ACCEPTABLE MANUFACTURERS

A. Metal Wall Panel Type: ‘A’

1. Basis-of-Design Product: Subject to compliance with requirements, provide PAC-CLAD “12” Wall Panel- Flush with center stiffening rib, 1” thick” panels with PVDF wood grain finish or comparable product by one of the following:

a. MBCI, a Cornerstone Group company.
b. Morin - A Kingspan Group Company.

B. Metal Wall Panel Type: ‘B’

1. Basis-of-Design Product: Subject to compliance with requirements, provide PAC-CLAD 16” Precision Series HWP 16 panels or comparable product by one of the following:

a. DMI Dimensional Metals
b. Morin – A Kingspan Group Company

C. NOTE: ROOF COPINGS, FLASHINGS, FASCIAS, TRIMS, DRIPS, ETC. WHERE ADJACENT TO METAL WALL PANELS SHALL BE FABRICATED BY THE METAL WALL PANEL MANUFACTURER, TYPICAL.

2.3 MATERIALS AND FINISHES

A. Preformed metal panels shall be fabricated of 24 GA and shall be leveled for flat appearance.
B. Colors shall be “Wood Grain Finish” and “Metallic Silver” to be selected from manufacturers full range of these patterns. Refer to the building elevations for locations of each pattern finish.

C. Finish shall be Kynar 500 or Hylar 5000 Fluorocarbon coating with a top side film thickness of 0.70 to 0.90 mil over a 0.25 to 0.3 mil prime coat to provide a total dry film thickness of 0.95 to 1.25 mil, to meet AAMA 621. Bottom side shall be coated with a primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesions, flexibility and longevity as specified by Kynar 500 or Hylar 5000 finish supplier.
D. If Strippable coating to be applied on the pre-finished panels to the top side to protect the finish during fabrication, shipping and handling, film shall be removed before installation.
E. Trim: Trim shall be fabricated of the same material and finish to match the profile, and will be press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer of their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting.
F. Accessories/Fasteners: Fasteners shall be of type, material, size, corrosion resistance, holding power and other properties required to fasten miscellaneous framing members to substrates. Accessories and their fasteners shall be capable of resisting the specified design wind uplift forces and shall allow for thermal movement of the wall panel system. Exposed fasteners shall not be accepted, all fasteners to be concealed.
G. Underlayment
    1. 1. On all surfaces to be covered with metal wall panels, furnish and install a vapor barrier or adhered membrane flashing full area where panels are installed. Vapor Barrier/ Adhered flashing to be by one of the following manufacturers:
        a. W.R Grace "Ice & Water Shield"
        b. Cetco Strongseal
        c. Carlisle CCW WIP 300HT
        d. Interwrap Titanium PSU
        e. MFM Corp "Wind & Water Shield"
        f. Polyguard Deck Guard HT of Polyglas HT
        g. Tamko TW Tile and Metal Underlayment
H. Sealants
    1. Provide two-part polysulfide class B non-sag type for vertical and horizontal joints or
    2. One part polysulfide not containing pitch or phenolic extenders or
    3. Exterior grade silicone sealant recommended by roofing manufacturer or
    4. One part non-sag, gun grade exterior type polyurethane recommended by the roofing manufacturer.

J. Pre-formed metal wall panels shall have one piece pre-formed outside corners integral to the panels. Trim at outside corners is not acceptable.

2.4 FABRICATION

A. Comply with dimensions, profile limitations, gauges and fabrication details shown and if not shown, provide manufacturer’s standard product fabrication.
    1. Max panel length is 55'.
B. Fabricate components of the system in factory, ready for field assembly.
C. Fabricate components and assemble units to comply with fire performance requirements specified.
D. Apply specified finishes in conformance with manufacturer’s standard, and according to manufacturer’s instructions.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine alignment of structural steel and related supports, primary and secondary roof framing, solid roof sheathing, prior to installation.
B. For the record, prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FASTENERS

A. Secure units to supports with concealed fasteners, where fasteners cannot be concealed, provide manufacturer trim to conceal fasteners.
B. Anchoring/ fastener pattern to be per manufacturer’s requirements.

3.3 INSTALLATION

A. Compliance: Comply with manufacturer’s product data, recommendations and installation instructions for substrate verification, preparation requirements and installation.
B. Panels shall be installed plumb and true in a proper alignment and in relation to the structural framing. The erector must have at least five years successful experience with similar applications.
C. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weather-tight installation.
D. Provide uniform, neat seams.
E. Fasteners: Conceal fasteners where possible in exposed work. Cover and seal fasteners and anchors for watertight and leakproof installation.
F. Remove all strippable coating and provide a dry-wipe down cleaning of the panels as they are erected.

3.4 DAMAGED MATERIAL

A. Upon determination of responsibility, repair or replace damaged metal panels and trim to the satisfaction of the Architect and Owner.

3.5 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damage installed products. Clean installed products in accordance with manufacturer's instruction prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 074213.13

SECTION 074213.19 - INSULATED METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Foamed-insulation-core metal wall panels.

2. Exterior Cladding Panel and Accessories

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel assembly during and after installation.
8. Review procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

B. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint

sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics, as determined by testing identical panels and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E 119.
2. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which wall panel is a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.
3. Radiant Heat Exposure: No ignition when tested according to NFPA 268.
4. Potential Heat: Acceptable level when tested according to NFPA 259.
5. Surface-Burning Characteristics: Provide wall panels with a flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E 84.

2.2 FOAMED-INSULATION-CORE METAL WALL PANELS TYPE ‘C’

A. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and insulation core foamed in place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.

1. Insulation Core: Modified isocyanurate or polyurethane foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.

a. Closed-Cell Content: 90 percent when tested according to ASTM D 6226.
b. Density: 2.0 to 2.6 lb/cu. ft. (32 to 42 kg/cu. m) when tested according to ASTM D 1622.
c. Compressive Strength: Minimum 20 psi (140 kPa) when tested according to ASTM D 1621.
d. Shear Strength: 26 psi (179 kPa) when tested according to ASTM C 273/C 273M.

B. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels.: Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Benchmark by Kingspan Designwall 2000 Architectural Wall Panel (24” Horizontal Flat) or comparable product by one of the following:

a. CENTRIA Architectural Systems; Formawall 1000.
b. MBCI; a division of NCI Group, Inc; TW-100 Wall Panel.

2. Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-

coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

a. Nominal Thickness: 0.022 inch (0.56 mm).
b. Exterior Finish: Smooth Face; Duracast Coating System (acrylic and silica coating over a polyester base coat).

1) Color: As selected by Architect from manufacturer's full range.

c. Interior Finish: Siliconized polyester.

1) Color: As selected by Architect from manufacturer's full range.

3. Panel Coverage: 24 inches (1016 mm) nominal.
4. Panel Thickness: 2.0 inches (51 mm).
5. Thermal-Resistance Value (R-Value): R-14 according to ASTM C 1363.
6. Factory radiused metal wall panels where indicated on drawings. Refer to drawings.
7. Flush metal wall panels except where 1” horizontal reveals and vertical joints are noted on the drawings.
8. Note: Roof copings, flashings, fascias, trims, drips, etc. where adjacent to metal wall panels shall be fabricated by the metal wall panel manufacturer, typical.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, (Class AZ50) Class AZM150 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-(25-mm-)thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if

they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 EXTERIOR ALUMINUM CLADDING PANEL AND ACCESSORIES

A. Acceptable Manufacturers of Aluminum Phenolic Composite Panels
   1. Basis of Design: Citadel Architectural Products Inc. – Panel 20
   2. Centria
   3. Fiberesin Industries Inc.

B. Exterior Cladding Panel
   1. Composition:
      a. Face: .024" (min) prefinished smooth aluminum
      b. Core: .075" thermoset phenolic resin
      c. Back: .024" primed smooth aluminum
   2. Thickness:
      a. 1/32” +/-
   3. Surface Burning Characteristics:
      Panel shall have a Class A rating with a Flame Spread Index less than 25, and a Smoke Developed Index less than 450. Testing shall be in accordance with ASTM E84.
   4. Finish: Selected from manufacturer’s full line of colors and finishes.
   5. Installation System:
      a. Two Piece Molding System:
         Field assembled installation system consisting of exterior cladding panels, trim moldings, silicone sealant, and accessories to provide a barrier system.
   6. Installation:
      a. Wall panel assembly shall be installed in accordance with the manufacturer's written installation guidelines and the approved set of shop drawings.

      b. Erect wall panel assembly level and true to the intended plane.

      c. Maximum deviation from vertical and horizontal alignment of erected wall panel assembly shall be no more than 1/4" in 20'-0".

      d. Maximum deviation in panel flatness shall be 0.6% of the assembled units.

      e. Seal all joints as required using methods and materials as recommended by the panel manufacturer

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

   1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
   2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

      a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal wall panel manufacturer.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.4 INSULATED METAL WALL PANEL INSTALLATION

A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.

1. Fasten foamed-insulation-core metal wall panels to supports with fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.
2. Apply panels and associated items true to line for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
3. Provide metal-backed washers under heads of exposed fasteners on weather side of insulated metal wall panels.
4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
5. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.
6. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.

B. Laminated-Insulation-Core Metal Wall Panels:

1. Wrapped-Edge Panels: Mechanically attach wall panels to supports using staggered, concealed side clips engaging wrapped panel edges. Install clips to supports with self-tapping fasteners. Seal joints with manufacturer's standard gaskets.
2. Shiplap-Edge Panels: Mechanically attach wall panels to supports using staggered, concealed side clips engaging tongue-and-groove panel edges. Install clips to supports with self-tapping fasteners.

    a. Horizontal Joints: Maintain reveal joint of consistent width.
    b. Vertical Joints: Maintain reveal joint of consistent width.

C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On

completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.19

SECTION 075700 - COATED FOAMED ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Extent of sprayed insulating roofing systems work is indicated on drawings and by requirements of this section. Extent of work includes but is not limited to.

1. Spray-applied, polyurethane foam insulation.
2. Insulation overlay board.
3. Spray applied walkway surfacing and spray foam roofing.

B. Related Sections:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking, and nailers.
2. Division 07 Section "Sheet Metal Flashing and Trim" for foam stops, roof penetration flashings, and counterflashings.
3. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 PERFORMANCE REQUIREMENTS

A. Watertightness: Provide coated foamed roofing that is watertight and will not permit the passage of water.

B. Material Compatibility: Provide polyurethane foam, elastomeric coatings, and miscellaneous roofing materials that are compatible with one another and able to bond to substrate under conditions of service and application required, as demonstrated by coated foamed roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide a coated foamed roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to Factory Mutual I-90 wind uplift rating.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties.

B. Samples for Initial Selection: For roof coating colors.

C. Samples for Verification: For coated foamed roofing, prepared on Samples of size indicated below:

1. Samples, 24 by 24 inches, on rigid backing, showing polyurethane foam of thickness required and stepped coatings in colors required to illustrate buildup of coated foamed roofing.

D. Qualification Data: For SPFA-qualified Installer and applicators.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for coated foamed roofing.

F. Field quality-control reports.

G. Maintenance Data: For coated foamed roofing to include in maintenance manuals.

H. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing product systems specified in this Section with a minimum twenty (20) years experience. Manufacturers' to have at least a Dun & Bradstreet rating of 5A or greater as well as minimum net worth of 200 million dollars.

B. Installer: Firm specializing in performing work of this Section with a minimum of twenty (20) years experience with a minimum of (20) million square feet successfully installed. Installer must be approved applicator by Manufacturer providing the warranty, and is capable of receiving specified (20) year NDL roof warranty.

1. Applicator shall be currently fully accredited by the SPFA (Spray Polyurethane Foam Alliance) for a minimum of at least (10) years, prior to submitting their bid on this project.

2. Applicator to be located and have maintained an office within 100 miles of the jobsite for at least the last ten years.

3. Applicator to provide 100% payment & performance bond to General Contractor for this portion of their Contract… if applicable.

4. Applicator to provide a list of at least (5) jobs similar in size, dollar amount and scope, which have been completed within the last (3) years prior to submitting their bid on this project.

5. Applicator to carry a minimum (8) million dollar insurance umbrella for their portion of this project.

6. Applicator to ensure all supervising personal onsite has 30-hour O.S.H.A cards.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire resistance ratings of roof assembly.

1.7 PRE-INSTALLATION CONFERENCE

A. Conduct conference at Project site minimum one week prior to beginning Work of this Section. Comply with requirements in Division 1 Section "Preconstruction Conferences."

B. Review installation procedures and coordination required with related work, including manufacturer's WRITTEN INSTRUCTIONS.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store liquid materials and other products in their original unopened containers or packaging until ready for installation.

B. Materials shall be clearly labeled with the manufacturer's name, product identification, safety information, and batch or lot numbers where appropriate.

C. Store materials out of the weather and out of direct sunlight in locations where the temperatures are within limits specified by manufacturer.

D. Protect stored products from ambient temperatures below 75 degrees F.

E. Comply with the manufacturer's instructions and SPFA for handling and safety procedures.

F. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's limits.

B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

C. Do not install foam insulation under the following conditions:

1) When ambient temperature is below 55 degrees F or above 110 degrees F.

2) When relative humidity is above 95 percent.

3) When wind velocity is above 10 mph, unless windscreens are utilized.

a) Installer to have onsite a windscreen to be used when needed.

4) When raining.

5) At temperature less than 5 degrees F above dew point.

D. Do not install protective silicone overcoat under the following conditions:

1) When ambient temperature is below 40 degrees F.

2) When wind velocity is above 10 mph, unless windscreens are utilized.

3) Installer to have onsite a windscreen to be used when needed.

4) When raining.

5) At temperature less than 5 degrees F above dew point.

1.10 WARRANTY

A. Special Watertight Warranty: Submit a written **no-dollar limit, non pro-rated**, warranty executed by manufacturer agreeing to repair or replace foam system components and associated trim, that fails to remain watertight within the specified warranty period. Watertight warranty includes roofing materials, base flashings, roofing accessories, roof insulation, fasteners, cover boards, walkway products and other components of roofing system.

1. Watertight Warranty Period: 20 years from date of Substantial Completion. (Refer to additional requirements in Independent Roof Inspection Services)

B. Special Roof Installer's Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including all components of roofing system such as roofing foam, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion. (Refer to additional requirements in Independent Roof Inspection Services)

PART 2 - PRODUCTS

2.1 Coated Foamed Roofing – Acceptable Manufacturers

A. General Electric

B. Bayer Chemical

2.2 SUBSTRATE BOARD

A. N/A

2.3 ROOF BOARD INSULATION

A. Polyisocyanurate: ASTM C1289, Type II, felt or glass-fiber mat on both major surfaces; minimum 20 psi compressive strength. R-value of polyisocyanurate insulation shall be based on LTTR 6 per inch of thickness. Thickness to be 1.5”

B. Insulation Overlay Board: 1/2 inch thick wood fiber board (recovery board) as manufactured by Celotex or as approved by coated foamed roofing manufacturer to maintain specified warranty.

2.4 FOAM INSULATION MATERIALS

A. Foam Insulation: Two component, closed-cell, rigid-class urethane foam, sprayed-in-place, with the following properties:

6) Density: ASTM D1622; 2.7 to 3.2 pounds per cubic foot.

7) Compressive Strength: ASTM D1621; 40 psi.

8) Tensile Strength: ASTM D1623, 80 psi.

9) Closed Cell Content: ASTM D2856, 90 percent, minimum.

10) Dimensional Stability: ASTM D2126, plus 8 percent maximum volume change at 28 days, 158 degrees F, 100 percent relative humidity.

11) Thermal Conductivity: ASTM C518, K factor of 0.15, aged.

12) Surface Burning Characteristics: ASTM E84, 75 maximum.

13) Smoke Developed Index: ASTM E84, 450 Maximum.

C. Substrate Primer: As required by roofing system manufacturer.

2.5 SILICONE MATERIALS

A. Overcoat: Silicone base and top coats with granulated surface complying with the following:

1) Tensile Strength: ASTM D412, 450.

2) Elongation: ASTM D412, 150 percent minimum at break at 75 degrees F.

3) Water Vapor Permeance: ASTM E398, 2.9 at 20 mils.

4) Fire resistance: ASTM E108, UL 790 Class A.

5) Color: Light Gray or Tan… Owner to select topcoat color.

6) Granulated surface: For cover coat complying with manufacturer's requirements.

2.6 ACCESSORIES

A. Cant: Spray applied foam insulation, filleted to interruptions and penetrations through the roof surface.

B. Sealant: Type recommended by the roofing system manufacturer.

C. Fasteners: Mechanical fasteners with plates as approved by roofing system manufacturer and in compliance with FM 4450 per I-90 wind uplift requirements.

D. Walkway Pads: Provide yellow spaghetti, breathable type mesh pads where indicated on Drawings.

2.7 Spray Applied Walkway Surfacing

A. Provide 24" wide roof walkway surface upon spray foam roofing. Utilize granular material integrated into silicone surface coat per manufacturer standards.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify deck surface is smooth and dry and deck joints do not exceed 1/16 inch. Verify deck slope prior to beginning installation.

B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.

C. Verify that concrete substrate is cured with moisture content not exceeding 12 percent. (if applicable)

D. Verify that metal deck has no gaps and laps are closed.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION – GENERAL

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving the best result for the substrate under project conditions indicated.

C. Roof Board Insulation: Prevent materials from getting wet.

D. Schedule work after penetrations through roof are complete and perimeter conditions are ready to receive roof system.

E. Comply with SPFA applicable guidelines.

F. Prevent materials from entering and clogging roof drains and from migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

G. Mask off adjacent surfaces that are not scheduled to receive foam.

3.3 PREPARATION - METAL DECK

A. Install insulation with fasteners recommended by roofing system manufacturer to achieve wind uplift requirements specified for roofing system.

1) Butt insulation ends firmly together along all edges without gaps or openings.

2) Protect cover board from getting wet after installation and prior to being protected by foam cover board that has been exposed to moisture must be replaced.

3) Remove loose dirt and debris by using compressed air, vacuum or light brooming.

4) Protect installed cover board from spills of contaminants such as oil, grease, solvents, etc. Replace cover board that has been exposed to such contaminants.

5) Remove materials or substances that will interfere with total adhesion of foam insulation to substrate.

6) Mask off adjacent surfaces that are not scheduled to receive foam.

3.4 SUBSTRATE BOARD INSTALLATION

A. N/A

3.5 ROOF BOARD INSULATION INSTALLATION

A. Coordinate installation of roof board insulation components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Install insulation to conform to slopes indicated. (See details)

C. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1) Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

D. Mechanically Fastened Insulation: Install all layers of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1) Fasten insulation according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.

2) Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

E. Install overlay board over insulation with long joints in continuous straight lines with end joints staggered between rows. Loosely butt cover boards together and fasten to roof deck.

1) Fasten cover boards according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.

2) Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.6 FOAM INSULATION INSTALLATION

A. Apply primer and foam insulation in accordance with manufacturer's written installation instructions.

B. Install foam insulation in multiple layers with minimum pass thickness of 1/2 inch.

1) Thickness: 1 1/2 inches unless otherwise indicated on Drawings.

2) Provide positive slope for drainage. (See details for tapered insulation board)

C. Install foam up vertical applications at walls with high/low roof intersections where noted and detailed. Foam on vertical applications to maintain minimum thickness noted in details to provide and weather tight enclosure. Contractor to coordinate installation and flashing with the varying vertical substrates including ICF, CMU, and Gyp Sheathing over metal studs.

D. Extend foam 2 inches up vertical intersections, fillet insulation, and feather out.

1) Form a cant of foam at perpendicular interruptions.

E. Apply foam to permit first coat of overcoat within 24 - 36 hours. If this time limit is exceeded, prepare foam skin surface in accordance with manufacturer's written instructions.

F. Develop finish skin surface to smooth and unbroken "orange peel" texture.

1) Uneven surfaces, "tree bark" or "popcorn" textures are not acceptable.

3.7 EXISTING FOAM ROOFING

A. Portions of new coated foamed roofing is to occur upon existing surfaces of coated foamed roofing. The contractor is responsible to assure compatibility of the new and existing coated foamed roofing and to scarify, prepare clean and/or supplement the existing roofing surfaces to accept new coated foam roofing per manufacturer's written instructions. Provide consistent slope of roofing as identified in the drawings. Portions of roof to receive new coating of spray foam roofing are to be provided with same warranty as new roofing identified in this section. The existing roofing remains under warranty. The contractor's product and work must not diminish or void the existing warranty. The contractor is to arrange visit(s) by manufacturer's representatives of the new and existing spray foam roofing to inspect the conditions and work and to assure watertight installation, compliance with manufacturer's requirements and issuance of warranties.

3.8 FLASHINGS AND ACCESSORIES

A. Coordinate installation of related flashings.

B. Seal flashings and flanges of items penetrating roofing system.

C. Install flexible walkway pads in locations indicated on Drawings. Adhere walkway products to substrate with compatible adhesive recommended by roofing system manufacturer.

3.9 SILICONE COATING INSTALLATION

A. Install coating in accordance with manufacturer's instructions.

B. Prepare and seal penetration through roof with sealant.

C. Apply silicone coating in two coats with dissimilar colors for each coat to a total dry mil thickness of 25 mils minimum.

D. Extend overcoat to cover foam insulation and extend 2 inches above foam termination on protrusions to a self-terminating, water seal.

E. Install granules in topcoat at rate recommended by manufacturer.

3.10 FIELD QUALITY CONTROL

A. Owner will engage the services of an independent party to periodically inspect roofing installation. Roofing system installer shall cooperate with personnel performing inspections. (If applicable)

B. Final Roof Inspection: Arrange for roofing system manufacturer’s technical personnel to inspect roofing installation on completion and submit report to Architect.

1) Notify Architect and Owner 48 hours in advance of date and time of inspection.

C. Repair or remove and replace components of roofing system where inspection results indicate that they do not comply with specified requirements.

3.11 CLEANING

A. Clean work under provisions of Division 1. Remove overspray from adjacent surfaces using cleaning agents and procedures recommended by manufacturer of affected construction.

B. Remove excess insulation or overcoat from finished surfaces.

C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.

D. Repair or replace defaced or disfigured finishes caused by work of this section.

3.12 PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of Division 1.

B. Ensure roof surface is free of traffic for minimum two (2) days after overcoat application.

ROOFING INSTALLER'S WARRANTY

A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <Insert name of Owner.>
2. Address: <Insert address.>
3. Building Name/Type: <Insert information.>
4. Address: <Insert address.>
5. Area of Work: <Insert information.>
6. Acceptance Date: <Insert date.>
7. Warranty Period: <Insert time.>
8. Expiration Date: <Insert date.>

B. AND WHEREAS Roofing Installer has contracted as a subcontractor to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions: Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

a) lightning;

b) peak gust wind speed exceeding 90 mph (m/sec);

c) fire;

d) failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;

e) faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;

f) vapor condensation on bottom of roofing; and

g) activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

E. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

F. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.

G. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

H. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

I. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

J. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to

Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

IN WITNESS THEREOF, this instrument has been duly executed this <**Insert day**> day of <**Insert month**>, <**Insert year**>.

1. Authorized Signature: <**Insert signature**.>
2. Name: <**Insert name**.>
3. Title: <**Insert title**.>

END OF SECTION 075700

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed wall sheet metal fabrications.
5. Formed equipment support flashing.
6. Gutters, Downspouts, Exposed Trim, Metal Fascia and Metal Copings

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Include details for forming, including profiles, shapes, seams, and dimensions.
3. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches (1:5).

C. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.8 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 5 years from date of Substantial Completion.

B. Project Installation Guarantee: Submit written agreement, signed by the Installer and Contractor, guaranteeing to correct failures in product, workmanship and water-tightness for a period of 2 years from date of Substantial Completion without reducing or otherwise limiting other rights to correction which the Owner may have under the Contract Documents. Failure is defined as faulty workmanship or product failure which leads to interruption of a watertight installation. The total system, no dollar limit guarantee, shall cover work of this section in its entirety.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Color: As selected by Architect from manufacturer's full range.
3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; with smooth, flat surface.

1. Finish: 2D (dull, cold rolled).

D. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 (Z275) coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.

1. Surface: and mill phosphatized for field painting.
2. Exposed Coil-Coated Finish:

    a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3. Color: As selected by Architect from manufacturer's full range.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

    a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
    c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
4. Fasteners for Zinc-Tin Alloy-Coated Stainless-Steel Sheet: Series 300 stainless steel.
5. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
6. Fasteners for Zinc Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Acceptable Manufacturers: Subject to compliance with the requirements, provide products by one of the following:

NOTE: ROOF COPINGS, FLASHINGS, FASCIAS, TRIMS, DRIPS, ETC WHERE ADJACENT TO METAL WALL PANELS SHALL BE FABRICATED BY THE METAL WALL PANEL MANUFACTURER, TYPICAL.

1. Fry Reglet Corporation
2. Hickman: W.P. Hickman Co.
3. Keystone Flashing Company

B. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with interlocking counterflashing on exterior face, of same metal as reglet.

1. Material: Galvanized steel, 0.022 inch (0.56 mm) thick.
2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
4. Accessories:

    a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
    b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.

5. Finish: Mill.

C. Hanging Gutters: Fabricate hanging gutters from the following material.

1. Galvanized Steel: 0.0336 inch (22 ga.) (0.855 mm) thick.

D. Downspouts: Fabricate downspouts from the following material.

1. Galvanized Steel: 0.0217 inch (26 ga.) (0.55 mm) thick.

E. Copings: Fabricate from the following material:

1. Galvanized Steel: 0.0336 inch (22ga) (0.85mm) thick.

F. Drip Edges: Fabricate from the following material:

1. Galvanized Steel: 0.0217 inch (26 ga) (0.55 mm) thick.

G. Equipment Support Flashing: Fabricate from the following material:

1. Galvanized Steel: 0.0276 inch (24 ga.) (0.7 mm) thick

H. Roof Penetration Flashing: Fabricate from the following material:

1. Galvanized Steel: 0.0276 inch (24 ga) (0.7 mm) thick

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection.

1. Where lapped of bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

I. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-(2400-mm-) long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.

1. Expansion Joints: Lap type.
2. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
3. Gutters with Girth 31 to 35 Inches (790 to 890 mm): Fabricate from the following materials:

    a. Galvanized Steel: 0.052 inch (1.32 mm) thick.

B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.

1. Fabricated Hanger Style: Fig 1-35A according to SMACNA's "Architectural Sheet Metal Manual."
2. Fabricate from the following materials:

    a. Galvanized Steel: 0.022 inch (0.56 mm) thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Copings: Fabricate in minimum 96-inch-(2400-mm-) long, but not exceeding 12-foot-(3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, solder or weld watertight. Shop fabricate interior and exterior corners.

1. Coping Profile: Fig 3-4D according to SMACNA's "Architectural Sheet Metal Manual."
2. Joint Style: Provide a 2" minimum and 4" maximum overlap with bed of sealant per SMACNA Plate 68, Alternate No. 2.
3. Fabricate from the Following Materials:

    a. Galvanized Steel: 0.040 inch (1.02 mm) thick (22 ga.).

B. Roof Expansion-Joint Cover: Fabricate from the following materials: Shop fabricate interior and exterior corners.

1. Galvanized Steel: 0.034 inch (0.86 mm) thick (22 ga.).

C. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch (0.71 mm) thick (24 ga.).

D. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch (0.56 mm) thick (26 ga.).

E. Flashing Receivers: Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch (0.56 mm) thick (26 ga.).

2.8 WALL SHEET METAL FABRICATIONS

A. Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch-(50-mm-) high, end dams. Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch (0.56 mm) thick (26 ga.).

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch (0.71 mm) thick (24 ga.).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings,

separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

E. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

A. Hanging Gutters: Join sections with joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Fasten gutter spacers to front and back of gutter.

2. Anchor and loosely lock back edge of gutter to continuous cleat.
3. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches (600 mm) apart.
4. Anchor gutter with gutter brackets spaced not more than 36 inches (910 mm) apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
5. Anchor gutter with spikes and ferrules spaced not more than 30 inches (760 mm) apart.
6. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet (15.24 m) apart. Install expansion-joint caps.
7. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.

B. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in asphalt roofing cement or elastomeric sealant compatible with the substrate.

C. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches (100 mm) in direction of water flow.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints minimum of 4 inches (100 mm). Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.7 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Nonstaining silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

a. Include test results performed on joint sealants after they have cured for 1 year.

C. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single source manufacturer for each different product required.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 NONSTAINING SILICONE JOINT SEALANTS

A. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Sika Corporation
b. Sonneborn Building Products Division ChemRex, Inc.
c. Tremco, Inc.
d. W.R. Meadows, Inc.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Sika Corporation
b. Sonneborn Building Products Division ChemRex, Inc.
c. Tremco, Inc.

d. W.R. Meadows, Inc.

2.4 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corp.
b. Protective Treatments, Inc.
c. Tremco, Inc.

2.5 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.

3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Glass.
    b. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
4. Provide flush joint profile at where indicated according to Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at where indicated according to Figure 8C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:

    a. Isolation and contraction joints in cast-in-place concrete slabs.

2. Joint Sealant: Urethane, M, P, 50, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

    a. Control and expansion joints in unit masonry.
    b. Perimeter joints between materials listed above and frames of doors, windows, and louvers.

c. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in tile flooring.

2. Joint Sealant: Urethane, S, P, 25, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Vertical joints on exposed surfaces of unit masonry.

2. Joint Sealant: Urethane, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.

1. Joint Locations:

a. Control joints on exposed interior surfaces of exterior walls.
b. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 079219 - ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical joint sealants to close all gaps at openings and joints at perimeter of all new and renovated rooms within the drawings.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.3 ACTION SUBMITTALS

A. Product Data: For each acoustical joint sealant.

1.4 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.

2.2 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. GE Construction Sealants; Momentive Performance Materials Inc; RCS20 Acoustical.
b. OSI Sealants; Henkel Corporation; OSI Pro-Series SC-175 Acoustical Sound Sealant.

c. Pecora Corporation; AC-20 FTR.
d. United States Gypsum Company; SHEETROCK Acoustical Sealant.

2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

2.3 MISCELLANEOUS MATERIALS

A. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.

B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such

protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079219

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes hollow-metal work.

B. Related Requirements:

1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

B. FEMA 361- Third Edition, 2015. Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms.

C. ICC 500- 2014. ICC/NSSA Standard for the Design and Construction of Storm Shelters.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-(102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld International, LLC.
2. Ceco Door; ASSA ABLOY.
3. Curries Company; ASSA ABLOY.
4. Deansteel Manufacturing Company, Inc.
5. Fleming Door Products Ltd.; Assa Abloy Group Company.
6. Mesker Door Inc.
7. Republic Doors and Frames.
8. Steelcraft; an Allegion brand.
9. Metal Products, Inc., Corbin, Kentucky

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

C. Tornado Rated Doors, Doors meeting or exceeding FEMA 361 and ICC 500-2014. Assembly to include frame mounting, frame construction, door construction, and hardware included within the assembly.

2.3 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2...

1. Physical Performance: Level B according to SDI A250.4.
2. Doors:

    a. Type: All interior hollow metal doors and frames listed in the Door and Frame Schedule.
    b. Thickness: 1-3/4 inches (44.5 mm).
    c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (1.0 mm).
    d. Edge Construction: Model 1, Full Flush.
    e. Core: Kraft-paper honeycomb.
    f. Fire-Rated Construction: Each door assembly in a fire rated construction needs to be properly labeled per NFPA requirements.

3. Frames:

    a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
    b. Non-Fire Rated Construction: Knocked down.
    c. Fire-Rated Construction: Fully Welded Type.

        1) Fire Rating: Same as door, labeled.

4. Exposed Finish: Prime.
5. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy coated (galvannealed), manufacturer's standard coating thickness.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3...

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:

    a. Type: As indicated in the Door and Frame Schedule.
    b. Thickness: 1-3/4 inches (44.5 mm.)
    c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
    d. Edge Construction: Model 2, Seamless.
    e. Core: Polystyrene.

1) Thermal-Rated Doors: Provide doors fabricated with U-Value of not less than 0.50 when tested according to ASTM C 1363.

3. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
b. Construction: Full profile welded.

4. Exposed Finish: Prime.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-(9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.6 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with requirements in Section 088000 "Glazing."

J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Fire Door Cores: As required to provide fire-protection ratings indicated.
2. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
3. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
4. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
5. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
6. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:

1) Two anchors per jamb up to 60 inches (1524 mm) high.
2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

1) Three anchors per jamb up to 60 inches (1524 mm) high.
2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.

c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow-metal work.
5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.9 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable stops located on secure side of opening.
    d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

f. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
6. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
c. At Bottom of Door: 5/8 inch (15.8 mm) plus or minus 1/32 inch (0.8 mm).
d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.
4. STC Rated Doors
5. Mini blinds for vision lites.

B. Related Requirements:

1. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during remainder of construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Graham Wood Doors; ASSA ABLOY Group company.
4. Lambton Doors.
5. Marshfield DoorSystems, Inc; Wood Veneered Doors.
6. Mohawk Flush Doors, Inc.
7. Oshkosh Door Company.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

D. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.

    a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
    b. 5-inch (125-mm) bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
    c. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
    d. The requirements above are minimums. Coordinate with door hardware to provide appropriately sized blocking.

3. STC Rated Doors: Provide STC Rated Doors to meet requirements indicated on drawings in addition to the following:
    a. Provide STC 50 rated doors at the Music Room Doors 164A, 164B and doors 167, 168A and 168B.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors.:

1. Grade: Premium, with Grade A faces.
2. Species: Red oak (match existing species, grain and color).
3. Cut: Plain sliced (flat sliced).
4. Match between Veneer Leaves: Pleasing match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 20 feet (6 m) or more.
8. Exposed Vertical and Top Edges: Same species as faces or a compatible species - edge Type A.
9. Core: Particleboard.
10. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
11. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Species compatible with door faces.
2. Profile: Flush rectangular beads.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.5 MINI BLINDS FOR VISION LITES

A. Factory fabricated to fit with 1/2” aluminum blade blinds with sealed glass unit. Provide privacy channels on both edges and slide magnetically operated controller. Owner to select finish from all manufacturer colors (minimum 1). Provide 10 year sealed unit warranty. Manufactured by air louvers, Bloomington, MN or equal.

2.6 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

2.7 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: WDMA TR-6 catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Sheen: Semigloss.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 083313 - COILING COUNTER DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Counter doors

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.
2. Section 087100 "Door Hardware" for key and cylinder requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For coiling doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.6 WARRANTY

A. Warranty: Manufacturer's 2 year door warranty for all parts and components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain coiling doors from single source from single manufacturer.

1. Obtain operators and controls from coiling door manufacturer.

2.2 COILING DOOR ASSEMBLY.

A. Coiling Door: Coiling door formed with curtain of interlocking metal slats.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cookson Company
b. Cornell Iron Works, Inc.
c. Overhead Door Corporation
d. Raynor
e. Wayne-Dalton Corp.

B. Operation Cycles: Door components and operators capable of operating for not less than 100,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

C. Door Curtain Material: Stainless steel.

D. Door Curtain Slats: Flat profile slats of 1-1/4-inch (32-mm) center-to-center height.

1. Gasket Seal. Manufacturer's standard continuous gaskets between slats.

E. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated stainless steel and finished to match door.

F. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.

G. Integral Frame, Hood, and Fascia: Stainless steel.

1. Mounting: Face of wall.

H. Sill Configuration: No sill.

1. Door shall rest on countertop or floor threshold when closed. Refer to drawings, and locking devices for bottom bar requirements.

I. Locking Devices: Equip door with locking device assembly.

1. Locking Device Assembly: Single-jamb side locking bars, operable from inside with thumb turn.

J. Manual Door Operator: Push-up operation.

K. Curtain Accessories: Equip door with push/pull handles.

L. Door Finish:

1. Stainless-Steel Finish: No. 4 (polished directional satin).
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.3 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate coiling door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Stainless-Steel Door Curtain Slats: ASTM A 666, Type 304; sheet thickness of 0.025 inch (0.64 mm); and as required.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

1. Removable Posts and Jamb Guides: Manufacturer's standard.

2.4 HOODS

A. Integral Frame, Hood, and Fascia: Welded sheet metal assembly of the following sheet metal(s):

1. Stainless Steel: Type 304, complying with ASTM A 666.

2.5 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Cylinders specified in Section 087100 "Door Hardware".

2.6 CURTAIN ACCESSORIES

A. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

2.7 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a

spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic closing device operates.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.8 MANUAL DOOR OPERATORS

A. General: Equip door with manual door operator by door manufacturer.

B. Push-up Door Operation: Design counterbalance mechanism so that required lift or pull for door operation does not exceed 25 lbf (111 N).

2.9 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

C. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

3.3 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.4 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.
2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

END OF SECTION 083313

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior storefront framing.
2. Storefront framing for window walls.
3. Storefront framing for punched openings.
4. Exterior manual-swing entrance doors.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

B. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm).

a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.

3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:

a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans less than 11 feet 8-1/4 inches (3.6 m).

E. Structural: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

2. Entrance Doors:

a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. (5.08 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

H. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K) as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than frame 47, glass 48 as determined according to NFRC 500.

I. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.

1. Outdoor-Indoor Transmission Class: Minimum 30.

J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

    a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
    b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
    c. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer "EnCore Framing System- 4 ½ inch and 6 inch deep with 1 3/4" sightline," depth as indicated in drawings or as required by manufacturer to achieve heights of framing indicated without additional cost. Comparable product by one of the following:

1. EFCO Corporation.
2. Kawneer North America; an Alcoa company.
3. TRACO.
4. Trulite Glass & Aluminum Solutions, LLC.
5. Tubelite Inc.
6. Vistawall International

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. Fabrication Method: Field-fabricated stick system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

    a. Sheet and Plate: ASTM B 209 (ASTM B 209M).
    b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
    c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
    d. Structural Profiles: ASTM B 308/B 308M.

2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

E. Extruded Aluminum Subsill: manufacturer's extruded aluminum sill, sloped for positive wash, to fit under sash leg. One piece full width of opening jamb, angles to terminate at sill end. Sill to be minimum a .125 inch thick and sloped for positive wash.

2.4 VENTING WINDOWS

A. Aluminum Windows: Manufacturer's standard units, complying with AAMA/WDMA/CSA 101/I.S.2/A440, with self-flashing mounting fins, and as follows:

1. Window Type: Awning.
2. Minimum Performance Class: AW.
3. Minimum Performance Grade: 45.
4. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 0.064-inch (1.63-mm) thickness at any location for main frame and sash members.

    a. Thermally Improved Construction: Fabricate window units with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.

5. Fasteners, Anchors, and Clips: Nonmagnetic stainless steel, aluminum, or other noncorrosive material, compatible with aluminum window members, trim, hardware, anchors, and other components of window units. Fasteners shall not be exposed, except for attaching hardware.

    a. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.128 inch (3.26 mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, spline grommet nuts.

6. Hardware: Manufacturer's standard; of aluminum, stainless steel, die-cast steel, malleable iron, or bronze; including the following:

    a. White Bronze Access control locks and keeper with One (1) A/C lock tool per classroom/ Office.
    b. Stainless steel 4 bar hinges to be included, with limiting hardware to adjust the opening size.

B. Glazing: Refer to Section 088000- Glazing.

C. Finish: Match adjacent aluminum-framed entrances and storefront finish.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 1 ¾-inch overall thickness, with minimum 0.188-inch-(4.8-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
2. Door Design: Wide stile; 5-inch (127-mm) nominal width.
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

2.6 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

2.7 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: Comply with Section 088000 "Glazing."

C. Glazing Sealants: Comply with Section 088000 "Glazing."

D. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.

1. Color: Match structural sealant.

2.8 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

E. Brackets and Reinforcements: Provide high-strength aluminum brackets and reinforcements; where use of aluminum is not feasible provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 123.

2.9 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

F. Storefront Framing: Fabricate components for assembly using head-and-sill-receptor system with shear blocks at intermediate horizontal members.

G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

I. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: To be selected from manufacturer full range of colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 088000 "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:

    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
    c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION 084113

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Glass for storefront framing and hollow metal framing.
2. Glazing sealants and accessories.
3. Translucent glazing units and 1” glazing units.
4. One way viewing glass.
5. Ceramic coated frit glass.

B. Related Requirements:

1. Section 084113 "Aluminum-Framed Entrances and Storefronts" for associated aluminum framing.
2. Section 081113 “Hollow Metal Doors and Frames”.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of the following products; 12 inches (300 mm) square.

1. Insulating glass (typical and spandrel).
2. Translucent insulating glass.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For glass.

C. Preconstruction adhesion and compatibility test report.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Install glazing in mockups specified in Section 084113 "Aluminum-Framed Entrances and Storefronts" to match glazing systems required for Project, including glazing methods.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

1.11 WARRANTY

A. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass

breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Glass Product: Subject to compliance with requirements, provide PPG Solarban 60 on Low-E product indicated or comparable product by one of the following:

1. Guardian Industries Corp.; SunGuard.
2. Pilkington North America.
3. PPG Flat Glass; PPG Industries, Inc.

B. Glass Fabricators: Acceptable fabricators of Sealed Glass Units, Heat-Strengthened Glass, Tempered Glass and Spandrel Glass:

1. Oldcastle Building Envelope
2. Glenny Glass
3. Trulite Glass and Aluminum Solutions, LLC
4. Viracon, Inc.

C. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

1. Obtain tinted glass from single source from single manufacturer.
2. Obtain reflective-coated glass from single source from single manufacturer.

D. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 CERAMIC COATED SPANDREL GLASS: ASTM C 1048, Condition B (spandrel glass, one surface ceramic coated), Type I (transparent flat glass), Quality-Q3, and complying with other requirements specified.

1. Fallout Resistance: Provide spandrel units identical to those passing the fallout-resistance test for spandrel glass specified in ASMT C 1048.

2. Available Products:

a. PPG Industries, Inc.
b. Pilkington Building Products North America; Opti-Float Clear Glass
c. Or equal.

2.3 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.

1. Design Wind Pressures: As indicated on Drawings.
2. Design Snow Loads: As indicated on Drawings.
3. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
2. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
3. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
4. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.4 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.5 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

1. Ultra-Clear (Low Iron) Float Glass with minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.6 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with polyisobutylene and silicone primary and secondary sealants.
2. Spacer: Manufacturer's standard spacer material and construction.
3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.7 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Field-applied sealants shall have a VOC content of not more than 250 g/L.
4. Sealants shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
5. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Acid-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Corporation; Construction Systems.
b. Dow Corning Corporation; DOW CORNING® 999A SILICONE GLAZING SEALANT.
c. GE Construction Sealants; Momentive Performance Materials Inc; SCS1000 Contractors.
d. Sika Corporation; Sikasil-GP.

2.8 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.10 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 INSULATING GLASS SCHEDULE

A. Glass Type: Low-E-coated, insulating glass.

1. Basis-of-Design Product: PPG Solarban 60 on Solar Gray Low E #2.
2. Overall Unit Thickness: 1 inch (25 mm).
3. Minimum Thickness of Each Glass Lite: 1/4 inch.
4. Outdoor Lite: Clear fully tempered float glass.
5. Interspace Content: Air.
6. Indoor Lite: Clear annealed float glass.
7. Low-E Coating: Sputtered on second surface.
8. Winter Nighttime U-Factor:.29 maximum.
9. Summer Daytime U-Factor:.27 maximum.
10. Visible Light Transmittance: 35 percent minimum.
11. Solar Heat Gain Coefficient:.25 maximum.

B. Glass Type: Low-E-coated, insulating glass spandrel units.

1. Basis-of-Design Product: PPG Solarban 60 on Solar Gray Low E #2.
2. Overall Unit Thickness: 1 inch (25 mm).
3. Minimum Thickness of Each Glass Lite: 1/4 inch.
4. Outdoor Lite: Clear fully tempered float glass.
5. Interspace Content: Air.
6. Indoor Lite: Clear annealed float glass.
7. Ceramic Frit (Manufacturer's Standard Selection) on Surface No. 4.
8. Low-E Coating: Sputtered on second surface.
9. Winter Nighttime U-Factor:.29 maximum.
10. Summer Daytime U-Factor:.27 maximum.
11. Visible Light Transmittance: 35 percent minimum.
12. Solar Heat Gain Coefficient:.25 maximum.

C. Glass Type: Translucent insulating glass.
1. Basis-of-Design Product: Advanced Glazings Ltd., "Solera L in white"
2. Overall Unit Thickness: 1 inch (25 mm).
3. Minimum Thickness of Each Glass Lite: 1/4" inch.
4. Outdoor Lite: Clear fully tempered float glass
5. Interspace Content: Air
6. Indoor Lite: Clear fully tempered float glass.
7. Summer Daytime U-Factor: 0.47
8. Visible Light Transmittance: 46%
9. Solar Heat Gain Coefficient: 0.11-0.58
10. At Spandrel Location (Frame Type C*): Provide ceramic frit on Surface No. 4 (White)

END OF SECTION 088000

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Requirements:

1. Section 061600 "Sheathing"
2. Section 092900 "Gypsum Board"

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

B. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.

1. Steel Studs and Runners:

    a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
    b. Depth: As indicated on Drawings.

2. Dimpled Steel Studs and Runners:

    a. Minimum Base-Metal Thickness: 0.025 inch (0.64 mm).
    b. Depth: As indicated on Drawings.

3. Steel stops at knee walls upon roof: 20 gage.

C. Slip-Type Head Joints: Where indicated, provide the following:

1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) Blazeframe Industries; Bare Slotted Track (BST/BST 2).
        2) Fire Trak Corp.
        3) Metal-Lite; The System.

D. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
2. Depth: 7/8 inch (22.2 mm).

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-(1.59-mm-)diameter wire, or double strand of 0.048-inch-(1.21-mm-)diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

    a. Type: Postinstalled, expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

D. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.

2. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.

3. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches (1219 mm) o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

B. Related Requirements:

1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
2. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Gypsum
2. CertainTeed Corporation
3. Georgia-Pacific Building Products
4. National Gypsum Company
5. United States Gypsum Company

B. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Thickness: 1/2 inch (12.7 mm) and 5/8 inch (15.9 mm).
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

C. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 1/2 inch (12.7 mm) and 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

E. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 2.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

F. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 SPECIALTY GYPSUM BOARD

A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. American Gypsum; FireBloc® Type C Gypsum Wallboard.
    b. CertainTeed Corporation; ProRoc Type C.
    c. Georgia-Pacific Building Products; Gold Bond Brand Fire-Shield C Wallboard.
    d. Lafarge North America Inc; Firecheck Type C.
    e. National Gypsum Company; Gold Bond Fire-Shield C.
    f. United States Gypsum Company; Firecode C Core.

2. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
3. Long Edges: Tapered.

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. CertainTeed Corporation; FiberCement BackerBoard.
    b. Custom Building Products; EasyBoard.
    c. National Gypsum Company; PermaBase BRAND Cement Board.
    d. United States Gypsum Company; DUROCK Cement Board.

2. Thickness: 1/2 inch (12.7 mm).
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

    a. Cornerbead.
    b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    c. L-Bead: L-shaped; exposed long flange receives joint compound.
    d. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fry Reglet Corporation.
b. Gordon, Inc.
c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Grabber Construction Products; Acoustical Sealant GSC.
b. Specified Technologies, Inc; Smoke N Sound Acoustical Sealant.
c. United States Gypsum Company; SHEETROCK Acoustical Sealant.

E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-(6.4- to 9.5-mm-)wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-(6.4- to 12.7-mm-)wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings.
2. Type X: As indicated on Drawings.
3. Ceiling Type: As indicated on Drawings.
4. Abuse-Resistant Type: As indicated on Drawings.
5. Moisture- and Mold-Resistant Type: As indicated on Drawings.
6. Type C: Where required for specific fire-resistance-rated assembly indicated.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

3.4 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.

C. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At all occupiable locations, unless noted otherwise on drawings..

a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.8 GYPSUM BOARD FINISH LEVEL DEFINITIONS (PER ASTM C 840 AND GYPSUM ASSOCIATION STANDARD)

A. Level 5

1. All joints and interior angles have tape that's embedded in joint compound plus two separate coats of compound over all flat joints and one separate coat over interior angles. Accessories and fastener heads are covered with three separate coats of joint compound. A thin skim coat of joint compound is applied over the entire surface. The surface should be smooth and free of ridges and tool marks.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Porcelain tile.
2. Stone thresholds.
3. Crack isolation membrane.
4. Non- Ceramic Trim, Transition and Finishing Strips

B. Related Sections:

1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Section 092900 "Gypsum Board" for cementitious backer units.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

1.5 MATERIALS MAINTENANCE SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.6 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type from one source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:

1. Stone thresholds.
2. Crack isolation membrane.
3. Joint sealants.
4. Non-Ceramic Trim, Transitions and Finishing Strips

D. Pre-installation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

2. Contractor to present shop drawing with proposed tile layout and trim locations.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. Tile Type: Wall Tile with Field Color and Accent Colors 1 and 2). (At single water closet restrooms).
1. Basis-of-Design Product: Subject to compliance with requirements, provide Portobello America “Color Market” or comparable product by one of the following:
   a. Florida Tile
   b. Daltile

2. Composition: Porcelain.
3. Module Size: 3 inches by 9 inches.
4. Surface: Matte.
5. Tile Color and Pattern: Color to be selected from full range of color, installed in Horizontal Running Bond Pattern.
6. Grout Color: Basis of Design, TEC – Color as selected from manufacturer’s full range of colors; 3/16” joints.
7. Base: Basis of Design Schluter DILEX-AHK-AE or equal.

B. Tile Type: Wall Accent Tile (at gang restrooms).

1. Basis-of-Design Product: Subject to compliance with requirements, provide Portobello “Cement Block” or comparable product by one of the following.
   a. Daltile
   b. Florida Tile

2. Composition: Porcelain
3. Module Size: Module: 12 inches by 36 inches
4. Tile Color and Pattern: Color to be selected from full range of color, installed in Running Bond Pattern.
5. Grout Color: Basis of Design TEC - Color as selected from manufacturer’s full range of colors; 1/8” joints.
6. Base: Base provided by floor installer.

C. Tile Type: Floor Tile

1. Basis-of-Design Product: Subject to compliance with requirements, provide Crossville Series “Relax” or comparable product by one of the following.

   a. Daltile
   b. Florida Tile, Inc.

2. Composition: Porcelain
3. Face Size: 6 inches by 36 inches
4. Tile Color: Staggered pattern; color as selected from manufacturer’s full range of colors.
5. Grout Color: Basis of Design TEC - Color as selected from manufacturer’s full range of colors; 3/16” joints.
6. Accessories: Schluter – TREP-E/EK at stair nosings (or approved equal).

2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.

B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.

1. Description: Uniform, fine- to medium-grained white stone with gray veining.
2. Description: Match Architect's sample.

2.4 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.

1. Products: Subject to compliance with requirements,

   a. Laticrete International, Inc; .

b. MAPEI Corporation.
c. TEC; H.B. Fuller Construction Products Inc Basis of Design Hydraflex (TA 316).

2.5 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Basis of Design TEC Medium Bed Mortar or comparable product by one of the following:

a. Custom Building Products.
b. Laticrete International, Inc; LATICRETE 254 Platinum.
c. TEC; H.B. Fuller Construction Products Inc.

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.6 GROUT MATERIALS

A. High Performance Grout:

1. Manufacturers: Basis of Design TEC Power Grout

a. Laticrete Grout Spectralock
b. Custom Building Products

2. Colors: Manufacturer's full range of color, refer to tiles listed above for preliminary color selections. Final approval and color selection to occur during construction.

2.7 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that match the Grout Colors.

1. Acceptable Manufacturers:
a. Custom Building Products
b. Laticrete International, Inc.
c. TEC; H.B. Fuller Construction Products Inc.

2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

D. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

E. Chemical-Resistant Sealants: For chemical-resistant floors, provide chemical-resistant elastomeric sealant of type recommended and produced by chemical-resistant mortar and grout manufacturer for type of application indicated, with proven service record and compatibility with tile and other setting materials, and with chemical resistance equivalent to mortar/grout.

2.8 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Inside and outside corner trim at all walls. Color as selected by Owner.

1. Manufacturers:

a. Schluter-Systems: www.schluter.com
b. Genesis APS International: www. genesis-aps.com
c. Blanke: www.blanke.com
d. Doral

2. Profiles: As indicated on Drawings and called out below.

a. Jolly (AMGB)
b. Reno- TK (AE) (Transition between ceramic tile and rubber floor tile)
c. Shiene- (AE 100)

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

C. Self-Leveling Spacers:

D. Wall and Floor Tile Levelers: Contractor's option to use leveling compound or leveling spacers as listed below:

1. Self-Leveler Manufacturers: Basis of Design TEC EZ Level with TEC 560 Multipurpose Primer

a. Custom Building Products
b. Laticrete
c. TEC

2. Spacer/ Leveler Manufacturers: Basis of Design

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series

"Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:

    a. Exterior tile floors.
    b. Tile floors in wet areas.
    c. Tile swimming pool decks.
    d. Tile floors in laundries.
    e. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
    f. Tile floors composed of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Glazed Wall Tile: 1/16 inch (1.6 mm).
2. Decorative Thin Wall Tile: 1/16 inch (1.6 mm).
3. Wood Floor Tile: 1/8 inch (1.8 mm)

F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

H. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).

I. Metal Edge Strips: Install at locations indicated.

3.4 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.5 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove epoxy grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes ceilings composed of acoustical panels, gypsum panels and exposed suspension systems.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Samples for initial selection in the form of manufacturer's color charts consisting of actual acoustical panels or sections of panels and sections of suspension system members showing the full range of colors, textures, and patterns available for each ceiling assembly indicated.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-response tests are performed by a qualified testing and inspecting agency. Qualified testing and inspecting agencies include Underwriters Laboratories (UL), Warnock Hersey, or another agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
2. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
3. Acoustical panel ceilings indicated are identical in materials and construction to those tested for fire resistance per ASTM E 119.
4. Fire-resistance-rated, acoustical panel ceilings are indicated by design designations listed in the UL "Fire Resistance Directory," in the Warnock Hersey "Certification Listings," or in the listing of another qualified testing and inspecting agency.
5. Products are identified with appropriate markings of applicable testing and inspecting agency.

C. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling panel from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

D. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes. Do not deliver any material to the project site until buildings normal operating temperature and humidity levels have been reached and will be maintained.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Space Enclosure and Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition assemblies (if any).

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 5.0 percent or one full carton whichever is greater of amount installed.
2. Exposed Suspension System Components: Furnish quantity of each exposed component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide products with physical and performance characteristics specified for each type of acoustical panel as manufactured by:

1. Armstrong World Industries, Inc.
2. Celotex Corporation.
3. USG Corporation.

2.2 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring Noise Reduction Coefficient (NRC): Type E-400 (plenum mounting in which face of test specimen is 15-3/4 inches 400 mm away from the test surface) per ASTM E 795.
2. Test Method for Ceiling Attenuation Class (CAC): Where acoustical panel ceilings are specified to have a CAC, provide units identical to those tested per ASTM E 1414 by a qualified testing agency.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by reference to ASTM E 1264 pattern designations and not to manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range of products that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 CEILINGS OF WATER-FELTED, MINERAL-BASE ACOUSTICAL PANELS (TYPE-A)

A. Panel Characteristics: Type III, Form 2 acoustical panels per ASTM E 1264, with painted finish, complying with pattern and other requirements indicated below:

1. Pattern: Panels fitting ASTM E 1264 pattern designations (pattern description) indicated below:
   a. Designation CD
2. Color/Light Reflectance Coefficient: White/LR 0.80 - 0.87.
3. Color: White.
4. Noise Reduction Coefficient: NRC 0.55.
5. Ceiling Attenuation: CAC 35-40.
6. Edge Detail: Square.
7. Thickness: 5/8 inch (16 mm).
8. Size: 24 by 48 inches (610 by 1220 mm).
9. Provide manufacturer’s ceiling panel designed to withstand a minimum of 104^{o}F and 90% relative humidity without visible sag. Provide manufacturer’s standard fifteen (15) year warranty against any visible sag in ceiling panel.
10. Design Basis: USG Radar Climaplus #2410, or equal.

B. Suspension System Type: As described below and specified in Part 2 "Non-Fire-Resistance-Rated, Direct-Hung Suspension Systems" Article:

1. USG Donn DX, or equal, wide-face, capped, double-web, steel suspension system. Color to be white.

2.4 ACOUSTICAL CEILING SYSTEM (TYPE-B)

A. Panel Characteristics: Vinyl clad gypsum board. Gypsum board with sealed edges, formulated especially for ceiling application in humid environments; 1/2 inch thick.

1. Size: 24 by 24 inches. (2 x 2)
2. Finish: Vinyl film
3. Color: White
4. Light Reflectance Coefficient: Minimum LR 0.77
5. Products with properties specified, which are comparable in appearance to the following, will be considered.
   a. Provide product as manufactured by USG Interiors, Inc., Chicago, Illinois with the following physical and performance characteristics.

b. Series: USG sheet rock lay-in, gypsum ceiling panel with laminated vinyl surface. Clima Plus laminated vinyl #3260, or equal
c. Color: White Sheet Rock
d. CAC minimum 35
e. Grid: USG Donn DX or equal
f. Edge DTL: Sq.

B. Exposed Grid: Provide non-rust type with other characteristics same as specified for the preceding lay-in acoustical ceiling system.

1. Provide aluminum grid cap at wet areas.

2.5 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 and ASTM C 636 requirements.

1. Accessories: Provide hold-down clips; minimum two per 2 feet of panel length at all vestibules and for a distance of 10 feet in from all exterior doors.

B. Finishes and Colors: Provide manufacturer's standard white factory-applied finish for type of system indicated.

C. Attachment Devices: Size for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

1. Cast-In-Place and Postinstalled Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attachment of hangers of type indicated and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling construction, as determined by testing per ASTM E 488, conducted by a qualified testing agency.

a. Type: Expansion anchors.
b. Corrosion Protection: Carbon steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC service condition (mild).

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon Steel Wire: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so that its stress at 3 times the hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than the yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

E. Hanger Rods: Mild steel, zinc coated, or protected with rust-inhibitive paint.

F. Flat Hangers: Mild steel, zinc coated, or protected with rust-inhibitive paint.

G. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide, formed with 0.0396-inch- (1-mm-) thick galvanized-steel sheet complying with ASTM A 446, G 90 (ASTM A 446M, Z 275) Coating Designation, with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

H. Sheet-Metal Edge Moldings and Trim: Type and profile indicated, or if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge

details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

1. For lay-in panels with reveal edge details, provide stepped-edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

I. Impact Clips: Where required, provide manufacturer's standard impact-clip system design to absorb impact forces against acoustical panels.

2.6 NON-FIRE-RESISTANCE-RATED, DIRECT-HUNG SUSPENSION SYSTEMS

A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from prepainted or electrolytic zinc-coated, cold-rolled steel sheet, with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges; other characteristics as follows:

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Override (stepped) or butt-edge type, as standard with manufacturer.
3. Cap Material and Finish: Steel sheet painted white.
4. Cap Material and Finish: Aluminum sheet with white painted finish. (Provide at dishwashing area.)

B. Products: Subject to compliance with requirements, provide one of the following:

1. Wide-Face, Capped, Double-Web, Steel Suspension Systems:

a. Prelude 15/16" Exposed Tee System (w/7300 m.r.); Armstrong World Industries, Inc.
b. 1200 System/211-219 Main Tee; Chicago Metallic Corporation.
c. DX 24 System; USG Interiors, Inc.

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:

1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.
2. Product has flame-spread and smoke-developed ratings of less than 25 per ASTM E 84.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

C. Products: Subject to compliance with requirements, provide one of the following.

1. Acoustical Sealant for Exposed and Concealed Joints:

a. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
b. SHEETROCK Acoustical Sealant; United States Gypsum Company.

2. Acoustical Sealant for Concealed Joints:

    a. BA-98; Pecora Corp.
    b. Tremco Acoustical Sealant; Tremco, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.

    1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

B. Measure each ceiling area and establish the layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans. Borders of 4" or less shall be on one side of space, coordinate with Architect prior to installation.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instructions and CISCA "Ceiling Systems Handbook."

    1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
    2. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
    3. CISCA Recommendations for Acoustical Ceilings: Comply with CISCA "Recommendations for Direct-Hung Acoustical Tile and Lay-In Panel Ceilings."
    4. CISCA Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies."
    5. U.B.C. Standard for Ceiling Suspension Systems: U.B.C. Standard No. 47-18.
    6. Ceiling grids will be no closer than 6” below the lowest obstruction above ceiling. Contact Architect prior to installation if conflict is observed.

B. Suspend ceiling hangers from building's structural members and as follows:

    1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system.
    2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
    3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension

members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms. Fasten hangers to cast-in-place hanger inserts, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise shown; and provide hangers not more than 8 inches (200 mm) from ends of each member.
9. All devices installed in ceilings or above ceilings shall be provided with independent supports. Provide extra hanger wires to support light fixtures, speakers, diffusers and similar devices independently of ceiling suspension system. Coordinate with electrical and mechanical work. Provide one hanger at each corner of fixtures and diffusers.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not over 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.18 mm in 3.66 m). Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.

1. Arrange directionally patterned acoustical panels in the manner as directed by Architect.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. Install hold-down clips in areas indicated and in areas required by governing regulations, or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.
5. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's instructions for cleaning and

touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Resilient base.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of product indicated.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.

2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC-RUBBER BASE.

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong World Industries, Inc.
2. Flexco
3. Burke Mercer Flooring Products
4. Nora Systems, Inc.
5. Roppe Corporation, USA
6. Musson Rubber Co.
7. Johnsonite; A Tarkett Company

B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).

1. Group: I (solid, homogeneous).
2. Style and Location:

a. Style B, Cove: Provide in areas with resilient flooring.

C. Thickness: 0.125 inch (3.2 mm).

D. Height: 4 inches (102 mm).

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Preformed.

G. Inside Corners: Preformed.

H. Colors: As selected by Architect from full range of industry colors.

2.2 RUBBER MOLDING ACCESSORY.

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Refer to list of approved manufacturers in section 2.1.A

B. Description: Rubber nosing for carpet, reducer strip for resilient flooring, and transition strips.

C. Profile and Dimensions: As indicated.

D. Locations: Provide rubber molding accessories in areas indicated.

E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096518 – LUXURY VINYL TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Luxury vinyl tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns. Refer to Architectural drawings,

C. Samples for Initial Selection: For each type of floor tile indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

PART 2 - PRODUCTS

2.1 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than [95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 80 deg F (35 deg C).

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 3 - PRODUCTS

3.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

3.2 LUXURY VINYL TILE 9” X 48” (LVT-1)

A. Products: Subject to compliance with requirements, provide the following:

1. Shaw luxury vinyl plank 9” x 48” unite Inlet. Spindle 26140.

B. Tile Standard: ASTM F 1700.

1. Class: As indicated by product designations Class III, surface-smooth luxury vinyl tile.
2. Type: A, smooth surface.

C. Thickness: .197 inches.

D. Size: 7” x 48”.

Colors and Patterns: Refer to architectural drawings for pattern.

LUXURY VINYL TILE 9” X 48” (LVT-2)

E. Products: Subject to compliance with requirements, provide the following:

1. Shaw luxury vinyl plank 9” x 48” unite inlet. Thatch 26720.

F. Tile Standard: ASTM F 1700.

1. Class: As indicated by product designations Class III, surface-smooth luxury vinyl tile.
2. Type: A, smooth surface.

G. Thickness: .197 inches.

H. Size: 9” x 48”.

I. Colors and Patterns: Refer to architectural drawings for pattern.

3.3 INSTALLATION MATERIALS

A. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Adhesives shall comply with the following limits for VOC content:

a. Luxury Vinyl Tile Adhesives: 50 g/L or less.

PART 4 - EXECUTION

4.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

4.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated on Drawing Sheet A9.1 and A9.2.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in one direction in pattern of colors and sizes indicated.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

4.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover floor tile until Substantial Completion.

END OF SECTION 096518

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Refer to Section 012300 – Alternates.

1.2 SUMMARY

A. Section Includes:

1. Solid vinyl floor tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of floor tile indicated.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

1.9 WARRANTY

A. Special adhered flooring installation Warranty: Flooring contractor to provide special 2 year floor finish installation warranty beginning on the date of substantial completion, warranting the floor finish installations from adhesive failure, full or partial, resulting from conditions present at the time of installation.

B. Flooring Product Warranty: Provide manufacturer's standard 10 year product wear warranty to replace products which fail within the warranty period

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL COMPOSITION FLOOR TILE

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. American Biltrite.
2. Armstrong World Industries, Inc.
3. Johnsonite; a Tarkett company.
4. Mannington Mills, Inc.

B. Tile Standard: ASTM F 1066, Class 3, surface-pattern tile.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch (3.2 mm).

E. Size: 12 by 12 inches (305 by 305 mm).

F. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Adhesives shall comply with the following limits for VOC content:

a. Vinyl Composition Tile Adhesives: 50 g/L or less.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Provide moisture limiter over existing slab per manufacturer’s instructions.

E. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

1. Install resilient reducer strips at exposed edges.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in one direction.
2. Do not mix manufacturing batches of a color within the same area.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

1. Do not install resilient flooring over building expansion joints.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between

pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply two coat(s).

E. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.

F. Sealers and Finish Coats: Remove soil, visible adhesive, and surface blemishes from resilient terrazzo floor tile surfaces before applying liquid cleaners, sealers, and finish products.

1. Sealer: Apply two base coats of liquid sealer.
2. Finish: Apply two coats of liquid floor finish.

G. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096623 - RESINOUS MATRIX TERRAZZO FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thin-set epoxy-resin terrazzo flooring and straight base.
2. Moisture vapor barrier below terrazzo.
3. Refer to Drawings for accent patterns and text graphics.

B. Related Sections:

1. Division 01 “Alternates”.
2. Division 03 “Cast in Place Concrete.
3. Division 07 Section "Joint Sealants" for sealants installed with terrazzo.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work. Show layout of the following:

1. Divider strips.
2. Control-joint strips.
3. Accessory strips.
4. Precast terrazzo jointing and edge configurations.
5. Terrazzo patterns as indicated in drawings.

C. Samples for Initial Selection: Manufacturer's color plates showing the full range of colors and patterns available for each terrazzo type indicated.

D. Samples for Verification: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and marble-chip and aggregate types, sizes, and proportions. Prepare samples of same thickness and from same material to be used for the Work in size indicated below:

1. Terrazzo: 6-inch- (150-mm-) square Samples.
2. Precast Terrazzo: 6-inch- (150-mm-) square Samples.
3. Accessories: 6-inch- (150-mm-) long Samples of each exposed strip item required.

E. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

F. Qualification Data: For qualified Installer.

G. Material Certificates: For each type of terrazzo material or product, from manufacturer.

H. Maintenance Data: For terrazzo to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who is acceptable to terrazzo manufacturer to install manufacturer's products.

1. Engage an installer who is certified in writing by terrazzo manufacturer as qualified to install manufacturer's products.
2. Engage an installer who is a contractor member of NTMA.

B. Source Limitations: Obtain primary terrazzo materials from one source from a single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.

C. Source Limitations for Marble Chips and Aggregates: Obtain each color, grade, type, and variety of granular materials from one source with resources to provide materials of consistent quality in appearance and physical properties.

D. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.

E. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to terrazzo including, but not limited to, the following:

a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
c. Review special terrazzo designs and patterns.
d. Review dust-control procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.

B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.

B. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.

C. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.

D. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.

E. Control and collect dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

1. Provide dustproof partitions and temporary enclosures to limit dust migration and to isolate areas from noise.

PART 2 - PRODUCTS

2.1 EPOXY-RESIN TERRAZZO

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. *Terrazzo & Marble Supply Companies; Terroxy Resin Systems.
2 ChemRex, Inc. / SKW-MBT Novalite
3. General Polymers Corporation; Terrazzo.
4. Key Resin Company; Key Epoxy Terrazzo.
5. Master Terrazzo Technologies LLC; Morricite.
6. Polymerica Incorporated; MasterPiece ETS.
7. Quadrant Chemical Corporation; Quadset Epoxy Terrazzo.

*Denotes Basis-of-Design Manufacturer

B. Materials:

1. Primer: Terroxy® Primer or Terroxy® Moisture Vapor Primer and Terroxy® Primer (for slabs on-grade or light-weight and green concrete), or equal.

a. Physical properties of moisture mitigating primer shall have a maximum of 0.3 perms with 100% RH.

2. Flexible Reinforcing Membrane: Terroxy® Iso-Crack Epoxy Membrane, or equal, for substrate crack preparation and reflective crack reduction. Supply membrane to cover 50% of terrazzo floor area.

a. Reinforcement: Fiberglass scrim.

3. Epoxy Matrix: Terroxy® Epoxy matrix, or equal, and in color required for mix indicated.

a. Physical properties without aggregates. All specimens cured for 7 days at 75°F plus or minus 2°F and 50 percent plus or minus 2 percent RH. This product shall meet the following requirements:

Property	**Test Method**	**NTMA Requirements**	**Terroxy® Thin-set Epoxy Terrazzo Typical Results**
Hardness	ASTM D-2240 using Shore-D Durometer	60-85	75-85
Tensile Strength	ASTM D-638	3,000 psi min.	4,800 psi min.
Compressive Strength	ASTM D-695 Specimen B cylinder	10,000 psi min.	12,000 psi min.
Flexural Strength	ASTM D-790	Not specified	4,500 psi min.
Chemical Resistance	ASTM D-1308 seven days at room temperature by immersion method	No deleterious effects: • Distilled Water • Mineral Oil • Isopropanol • Ethanol • 0.025 Detergent Solution • 1% Soap Solution • 10% Sodium Hydroxide • 10% Hydrochloric Acid • 30% Sulfuric Acid • 5% Acetic Acid	No deleterious effects: • Distilled Water • Mineral Oil • Isopropanol • Ethanol • 0.025 Detergent Solution • 1% Soap Solution • 10% Sodium Hydroxide • 10% Hydrochloric Acid • 30% Sulfuric Acid • 5% Acetic Acid

b. Physical properties with aggregates. For Epoxy Matrix blended with three volumes of Georgia White marble blended 60% #1 chip and 40% #0 chip, ground and grouted with epoxy resin according to Installation Specifications, finishing to a minimum 1/4" thickness. All specimens cured for 7 days at 75°F plus or minus 2°F and 50 percent RH plus or minus 2 percent RH. This finished Epoxy Matrix shall meet the following requirements:

Property	**Test Method**	**NTMA Requirements**	**Terroxy® Thin-set Epoxy Terrazzo Typical Results**
Flammability	ASTM D-635	Self-extinguishing, extent of burning 0.025 inches max.	Self-extinguishing, extent of burning 0.025 inches max.
Thermal Coefficient of Linear Expansion	ASTM D-696	25x10 to the -6 power inches per inch per degrees to 140°F	25x10 to the -6 power inches per inch per degrees to 140°F
Bond Strength	ACI COMM 403, Bulletin 59-43 (pages 1139-1141)	300 psi (100% concrete failure)	300 psi (100% concrete failure)

4. Aggregates including Marble, Glass, Mother of Pearl Complying with NTMA gradation standards for mix indicated and containing no deleterious or foreign matter.

a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131.
b. 24-Hour Absorption Rate: Less than 0.74 percent.
c. Dust Content: Less than 1.0 percent by weight.

5. Finishing Grout: Terroxy® Epoxy Matrix or Terroxy® Clear Resin as recommended by Terroxy® Resin Systems or equal.

C. Mix: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.

1. Color and Pattern: Contractor to provide all terrazzo areas, field and accent, indicated in Drawings with a mix of 20% mother of pearl aggregate, 35% one-sided mirror aggregate and 45% standard marbled chip aggregate. Refer to Drawings for layout and quantities.

2.2 STRIP MATERIALS

A. Thin-Set Divider Strips: L-type.

1. Material: Aluminum.
2. Guide for commonly used L-type divider strips for Thin-set Epoxy Terrazzo Systems:

System Height	Strip Height	Strip Width
1/4" System	1/4"	16 gauge 1/8" 1/4"
3/8" System	3/8"	

B. Control-Joint Strips: Separate double L-type angles back to back with minimum 1/8"-1/4" width between. (Single L-type angel, positioned adjacent to the joint is also acceptable.) Fill joint and area between strips with semi-flexible joint filler. Match material, thickness and color of divider strips and depth required for topping thickness indicated.

C. Construction-Joint (Cold-Joint) Strips: Separate double L-type angles back to back with minimum 1/8"-1/4" width between. Fill joint and area between strips with semi-flexible joint filler. Match material, thickness and color of divider strips and depth required for topping thickness indicated.

D. Expansion-Joint Strips: Separate double L-type angles, positioned back to back with minimum 1/8"-1/4" width between. Fill area between strips with semi-flexible joint filler. Match material, thickness and color of divider strips and depth required for topping thickness indicated.

E. Accessory Strips: Match divider strip width, material and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:

1. Base-bead strips for exposed top of terrazzo base.
2. Edge-bead for exposed edges of terrazzo.

2.3 MISCELLANEOUS ACCESSORIES

A. Strip Adhesive: 100% solids epoxy resin adhesive recommended by Terroxy® Resin Systems.

1. Use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Anchoring Devices:

1. Strips: Provide mechanical anchoring devices for strip materials as required for secure attachment to substrate.

2. Precast Terrazzo: Provide mechanical anchoring devices as recommended by Terrazzo Contractor for proper anchorage and support of units for conditions of installation and support.

C. Patching and Fill Material: Terroxy® Fill and selected aggregates as recommended by Terroxy® Resin Systems.

D. Joint Compound: Terroxy® Joint Filler, color to be selected by architect to match/compliment terrazzo.

E. Cleaner: Terroxy® Terra Clean, a neutral cleaner with pH factor between 7 and 10 specifically designed for terrazzo.

F. Surface Finish System: Terroxy® Natural Finish System, level of polish to be specified by architect in accordance with desired appearance and level of reflectivity.

G. **Moisture Vapor Barrier- As part of the base bid areas, contractor to include a moisture barrier over the concrete slab. Moisture mitigation product to meet all NTMA standards for installation and apply only at the corridors.**

H. Sealer: Slip-and stain-resistant sealer that is chemically neutral with a pH factor between 7 and 10; a standard coefficient of friction of .06 or higher for floors; a standard coefficient of friction of 0.8 or higher at ramps; does not affect physical properties of terrazzo and complies with NTMA's "Terrazzo Specifications and Design Guide".

2.4 PRECAST TERRAZZO

A. Precast Terrazzo Units: Precast epoxy-resin terrazzo base and stair tread and riser units.

1. Available Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Terroxy® Resin Systems.

B. Precast Terrazzo Base Units: 3/8 inch thick; cast in maximum lengths possible, but not less than 36 inches (900 mm). Some locations require radius as required to conform to radiused substrates.

1. Type: Straight (non-cove).
2. Height: (5 1/2") five and one half inches.
3. Outside Corner Units: With finished returned edges at outside corner.
4. Color and Pattern: Match adjacent poured-in-place terrazzo flooring as selected and indicated in patterns on plans.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

3.2 PREPARATION

A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.

B. Concrete Slabs:

1. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.

    a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
    b. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written recommendations.
    c. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.

2. Verify that concrete substrates are visibly dry and free of moisture.
3. Moisture Testing:

    a. Test for moisture by relative humidity probe and digital meter method according to ASTM F 2170. Proceed with installation only after substrates have a relative-humidity-measurement reading of less than 80% in 24 hours. If relative humidity measurement reading is greater than or equal to 80%, Terroxy® Moisture Vapor Primer is recommended. Apply to terrazzo substrates according to Terroxy® Resin Systems Moisture Vapor Primer Product Data Sheet.

C. Protect other work from dust generated by grinding operations. Control dust to prevent air pollution and comply with environmental protection regulations.

1. Erect and maintain temporary enclosures and other suitable methods to limit dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

D. Installation of terrazzo indicates acceptance of surfaces and conditions.

3.3 EPOXY-RESIN TERRAZZO INSTALLATION

A. General:

1. Comply with NTMA's written recommendations for terrazzo and accessory installation.
2. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions and NTMA's "Terrazzo Specifications and Design Guide."
3. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet (6 mm in 3 m); noncumulative.
4. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.

5. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.

B. Thickness: 1/4 inch (6.4 mm) nominal.

C. Flexible Reinforcing Membrane:

1. Prepare and prefill substrate cracks with membrane material.
2. Membrane application for isolated cracking and at all structural joints. Route out all cracks and fill with semi-flexible epoxy. Apply Terroxy® Iso-Crack Epoxy Membrane (spread at 40 mils thickness) across the crack allowing 12 inches on either side. Imbed fiberglass scrim into wet membrane and saturate with additional membrane.
3. Prepare membrane according to manufacturer's written instructions before applying substrate primer.

D. Primer: Apply to terrazzo substrates according to manufacturer's written instructions.

E. Strip Materials:

1. Divider and Accessory Strips:

a. Install strips in adhesive setting bed without voids below strips or mechanically anchor strips as required to attach strips to substrate.
b. Control-Joint Strips: Separate double L-type angles, positioned back to back with minimum 1/8”- 1/4” width between. (Single L-type angle, positioned adjacent to the joint is also acceptable.) Fill joint and area between strips with semi-flexible Terroxy® Joint Filler. Match material, thickness and color of divider strips and depth required for topping thickness indicated.
c. Construction-Joint (Cold-Joint) Strips: Separate double L-type angles, positioned back to back with minimum 1/8”- 1/4” width between. Fill joint and area between strips with semi-flexible Terroxy® Joint Filler. Match material, thickness and color of divider strips and depth required for topping thickness indicated.
d. Expansion-Joint Strips: Separate double L-type angles, positioned back to back with minimum 1/8”- 1/4” width between. Fill joint and area between strips with semi-flexible Terroxy® Joint Filler. Match material, thickness and color of divider strips and depth required for topping thickness indicated.

F. Placing Terrazzo:

1. Mix epoxy with chips and fillers in ratios directed by Terroxy® Resin Systems.
2. Trowel apply terrazzo mixture over epoxy primer to provide a dense flat surface to top of divider strips. Allow to cure per Terroxy® Resin Systems recommendations before rough grinding.

G. Rough Grinding: Grind with 24 grit silicon carbide or D-36 Diamond matrix stones until all Terrazzo strips and marble ships are uniformly exposed.

H. Grouting:

1. Cleanse floor with clean water and rinse.
2. Remove excess rinse water by wet vacuum, dry and fill voids with Terroxy® Resin Systems Epoxy Matrix or Clear Resin.
3. Allow grout to cure. Grout may be left on terrazzo until other trades work is completed.

I. Polishing: Grind with 120 grit or finer stones until all grout is removed from surface. Repeat rough grinding, grout coat and polishing if large terrazzo chip voids exist after initial polishing. Produce surface with a minimum of 70 percent aggregate exposure.

J. Surface Finishing:

1. Flood mop and wet vac all slurry surface, using Terroxy® Terra Clean per Terroxy® Resin Systems recommendations insuring all latency and particulate matter is removed.
2. Continue grinding process with Genesis diamond grits 220, 400 and 600. Repeating Step #1 between steps insuring all previous grit latency and particulate matter is removed.
3. Inspect entire surface for consistent appearance, manifesting no abrasion scratches from previous grits. Readdress any area manifesting previous grit scratch pattern not matching 600 grit finish before continuing.
4. Mechanically polish surface using 1,000 grit Ceramica diamond pads as supplied by Terrazzo & Marble Supply. Surface shall have uniform reflective appearance showing no high or low sheen variances.
5. Flood mop and wet vac as described in Step #1 insuring no presence of any particulate matte or other trades' dirt or oils.
6. Final polish surface using Terroxy® Terra Polish per Terroxy® Resin Systems recommendations with 3M or equal white polishing pad equipped on a 175 rpm floor machine with solution tank and standard pad driver as supplied by Terrazzo and Marble Supply.
7. Thoroughly scrub and agitate entire surface using Terroxy® Terra Clean per Terroxy® Resin Systems recommendations, wet vac scrub from surface insuring all final chemistry is removed.
8. Once surface is entirely dry, allowing four hours minimum, impregnate and seal surface with Terroxy® Terra tight Impregnator as needed per Terroxy® Resin Systems recommendations. Following directions, remove any excess.
9. Allow 24 hours before use or open traffic. Maintain surface with Terroxy® Terra Clean as daily maintenance cleaner. Periodically spot polish high-traffic areas with Terroxy® Terra Polish as needed to maintain uniform appearance. Bi-annually impregnate surface to preserve per Terroxy® Natural Finish System (as needed).

K. Repair: Remove and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.4 PRECAST TERRAZZO INSTALLATION

A. Install precast terrazzo units using method recommended by NTMA and manufacturer unless otherwise indicated.

B. Seal joints between units with joint sealants.

3.5 CLEANING AND PROTECTION

A. Cleaning:

1. Remove grinding dust from installation and adjacent areas.
2. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow to dry thoroughly.

B. Sealing:

1. Seal surfaces according to NTMA's written recommendations.
2. Apply sealer according to sealer manufacturer's written instructions.

C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION 096623

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Steel.
2. Galvanized metal.

B. Related Requirements:

1. Section 099123 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Coronado Paint, Benjamin Moore Company
2. PPG Architectural Coatings.
3. Sherwin-Williams Company (The)

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

D. Colors: As selected by Architect from manufacturer's full range.

2.3 METAL PRIMERS

A. Primer, Alkyd, Anti-Corrosive for Metal: MPI #79.

1. Sherwin-Williams (Basis of Design Kromik Universal Primer).

2.4 WATER-BASED PAINTS

A. Light Industrial Coating, Exterior, Water Based (Gloss Level 3): MPI #161.

1. Sherwin-Williams (Pro Industrial DTM Acrylic Eg Shel).

2.5 SOLVENT-BASED PAINTS

A. Alkyd, Exterior, Semi-Gloss (Gloss Level 5): MPI #94.

1. Sherwin Williams (Basis of Design DTM Alkyd Semi-Gloss).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Pipe hangers and supports.
d. Metal conduit.
e. Tanks that do not have factory-applied final finishes.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Water-Based Light Industrial Coating System:

    a. Prime Coat: Primer, alkyd, anti-corrosive for metal, MPI #79.
    b. Prime Coat: Shop primer specified in Section where substrate is specified.
    c. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
    d. Topcoat: Light industrial coating, exterior, water based (Gloss Level 3), MPI #161.

2. Alkyd System:

    a. Prime Coat: Primer, alkyd, anticorrosive for metal, MPI #79.
    b. Prime Coat: Shop primer specified in Section where substrate is specified.
    c. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    d. Topcoat: Alkyd, exterior, semi-gloss (Gloss Level 5), MPI #94.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates and staining and transparent finishing on wood substrates:

1. Concrete.
2. Concrete masonry units (CMU).
3. Galvanized metal.
4. Gypsum board.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
2. Section 064100 “Architectural Wood Casework” for wood trim work to receive stains and clear finishing.
3. Section 099113 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.
2. PPG Architectural Coatings.
3. Sherwin Williams Company (The)

B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. Colors: As selected by Architect from manufacturer's full range.

2.3 BLOCK FILLERS

A. Block Filler, Latex, Interior/Exterior: MPI #4.

1. Sherwin Williams "Loxon Block Surfacer".

2.4 PRIMERS/SEALERS

A. Primer Sealer, Latex, Interior: MPI #50.

1. Sherwin Williams "Drywall Primer".

B. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

1. Sherwin Williams "Premium Wall & Wood Primer".

2.5 METAL PRIMERS

A. Primer, Rust-Inhibitive, Water Based: MPI #107.

1. Sherwin Williams "Pro Industrial Pro-Cryl Universal Primer".

2.6 WATER-BASED PAINTS

A. Latex, Interior, (Gloss Level 3): MPI #52.

1. Sherwin Williams "Pro Mar 200 Zero Interior Latex Eg-Shel".

2.7 SOLVENT-BASED PAINTS

A. Alkyd, Interior, Semi-Gloss (Gloss Level 5): MPI #47.

1. Sherwin Williams "Pro Mar 200 Alkyd Semi-Gloss".

2.8 DRY FOG/FALL COATINGS

A. Dry Fall, Latex, Flat: MPI #118.

1. Sherwin Williams (Basis of Design Pro Industrial Waterborne Arcylic Dryfall).

2.9 FLOOR COATINGS

A. Sealer, Solvent Based, for Concrete Floors: MPI #104.

1. Sherwin Williams "H & C Decorative Concrete Sealer".

2.10 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.
5. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

F. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

G. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

G. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Wood substrates, nontraffic surfaces, including wood trim.

1. Polyurethane Varnish System:

a. Prime Coat: Polyurethane varnish matching topcoat.
b. Intermediate Coat: Polyurethane varnish matching topcoat.
c. Topcoat: Varnish, interior, polyurethane, oil-modified, gloss (Gloss Level 6).

END OF SECTION 099123

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Visual display board assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.

B. Shop Drawings: For visual display units.

1. Include plans, elevations, sections, details, and attachment to other work.
2. Show locations of panel joints.
3. Include sections of typical trim members.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display units to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 VISUAL DISPLAY BOARD ASSEMBLY.

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Claridge Products and Equipment, Inc.
2. Marsh Industries, Inc.
3. Nelson Adams NACO

B. Visual Display Board Assembly: factory fabricated.

1. Assembly: markerboard and tackboard.
2. Corners: Square.
3. Width: As indicated on Drawings.
4. Height: As indicated on Drawings.
5. Mounting Method: Direct to wall.

C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.

1. Color: White.

D. Tackboard Panel: Vinyl-fabric-faced tackboard panel on core indicated.

1. Fabric Wrapped Edge: Wrap edge of tackboard panel with fabric facing.
2. Color and Pattern: As selected by Architect from full range of industry colors.

E. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-(1.57-mm-)thick, extruded aluminum; standard size and shape.

1. Aluminum Finish: Clear anodic finish.

F. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.

G. Combination Assemblies: Provide H-trim between abutting sections of visual display panels.

H. Chalktray/ Marker Tray: Manufacturer's standard; continuous.

1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.

I. Display Rail: Manufacturer's standard, extruded-aluminum display rail with insert, end stops, and continuous paper holder, designed to hold accessories.

1. Size: 1 inch (25 mm) high by full length of visual display unit.
2. Map Hooks: Two map hooks for every 48 inches (1200 mm) of display rail or fraction thereof.
3. Map Hooks and Clips: Two map hooks with flexible metal clips for every 48 inches (1200 mm) of display rail or fraction thereof.
4. Flag Holder: One for each room.
5. Aluminum Color: Match finish of visual display assembly trim.

2.4 MARKERBOARD PANELS

A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.

1. Face Sheet Thickness: 0.021 inch (0.53 mm) uncoated base metal thickness.
2. Particleboard Core: 3/8 inch (9.5 mm) thick; with 0.015-inch-(0.38-mm-)thick, aluminum sheet backing.
3. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.
4. Backing Sheet: Steel backing.

2.5 TACKBOARD PANELS

A. Tackboard Panels:

1. Facing: 1/4-inch-(6-mm-) thick.
2. Facing: Vinyl fabric.
3. Core: 3/8-inch-(9.5-mm-) thick fiberboard.

2.6 MATERIALS

A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

B. Vinyl Fabric: Mildew resistant, washable, complying with FS CCC-W-408D, Type II, burlap weave; weighing not less than 13 oz./sq. yd. (440 g/sq. m); with surface-burning characteristics indicated.

C. Polyester Fabric: Nondirectional weave, 100 percent polyester; weighing not less than 15 oz./sq. yd. (508 g/sq. m); with surface-burning characteristics indicated.

D. Hardboard: ANSI A135.4, tempered.

E. Particleboard: ANSI A208.1, Grade M-1.

F. Medium-Density Fiberboard: ANSI A208.2.

G. Fiberboard: ASTM C 208 cellulosic fiber insulating board.

H. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.

I. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

B. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.

C. Baked-Enamel or Powder-Coat Finish: AAMA 2603, except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display units.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.

3.3 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Factory-Fabricated Visual Display Board Assemblies: Adhere to wall surfaces with egg-size adhesive gobs at 16 inches (400 mm) o.c., horizontally and vertically.

C. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches (400 mm) o.c. Secure tops and bottoms of boards to walls.

D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated below.

1. Mounting Height for Grades K through 3: 24 inches (610 mm) above finished floor to top of marker tray.
2. Mounting Height for Grades 4 through 6: 28 inches (711 mm) above finished floor to top of marker tray.
3. Mounting Height for Grades 7 and Higher: 36 inches (914 mm) above finished floor to top of marker tray.

3.4 CLEANING AND PROTECTION

A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100

SECTION 101416 - PLAQUES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes plaques.

B. Related Requirements:

1. Section 101423 "Panel Signage" for signs, with or without frames, that are made of materials other than solid metal.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of plaque, exposed component, and exposed finish.

C. Plaque Schedule: Use same designations specified or indicated on Drawings or in a plaque or sign schedule.

1. Content of sign is to be determined at a later date. Request plaque information from School District through Sherman Carter Barnhart Architects, PLLC at least 2 months prior to fabrication.
2. Submit for approval by School Board through Sherman Carter Barnhart Architects, PLLC prior to fabrication.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for signs.

2.2 PLAQUES

A. Cast Plaque: 18” x 24” plaque with background texture, border, and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Andco Industries Corp.
    b. ARK Ramos Manufacturing Company, Inc.
    c. Best Sign Systems, Inc.
    d. Fast Signs
    e. Nelson Harkins
    f. Grandview Aluminum Products, Inc.
    g. Mills Manufacturing

2. Plaque Material: Cast aluminum.
3. Plaque Thickness: 0.50 inch (12.7 mm).
4. Finishes:

    a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.

5. Background Texture: Pebble.
6. Integrally Cast Border Style: Double-raised line border.
7. Mounting: Mount plaques using the standard method recommended by the manufacturer for the type of wall surface indicated.
8. Location: To be identified by Owner. Provide blocking as needed.

2.3 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by plaque manufacturer for casting process used and for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of plaques, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.

2. Exposed Metal-Fastener Components, General:

a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.

2.5 FABRICATION

A. General: Provide manufacturer's standard plaques according to requirements indicated.

1. Preassemble plaques in the shop to greatest extent possible. Disassemble plaques only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match plaque finish.
6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of plaque work.

B. Verify that plaque-support surfaces are within tolerances to accommodate plaques without gaps or irregularities between backs of plaques and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install plaques using mounting methods indicated and according to manufacturer's written instructions.

1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
2. Install plaques so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed plaques and plaques that do not comply with specified requirements. Replace plaques with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as plaques are installed.

C. On completion of installation, clean exposed surfaces of plaques according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain plaques in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101416

SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fabricated channel dimensional characters.
2. Vinyl Exterior Lettering/ Numbering

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

C. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior fabricated channel dimensional characters, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 VINYL LETTERING SIGNAGE

A. Cut vinyl lettering rated for exterior use. Size and locations as indicated on drawings.

B. Mounting: removable surface mount on glass.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers listed in this specification section 2.3.A.1.

D. Color: As selected by Architect from Manufacturers full range of standard colors.

2.3 DIMENSIONAL CHARACTERS

A. Fabricated Channel Characters. Metal face and side returns, formed free from warp and distortion; with uniform faces, sharp corners, and precisely formed lines and profiles; internally braced for stability and for securing fasteners; and as follows.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Andco Industries, Corp.
b. ASI Sign Systems, Inc.
c. Fast Signs
d. Best Sign Systems, Inc.
e. Contemporary Plastics, Inc.
f. Nelson Harkins
g. ARK Ramos Manufacturing Company, Inc.
h. Mills Manufacturing

2. Character Material: Sheet or plate aluminum.
3. Material Thickness: 1/4".
4. Character Height: As indicated on drawings.
5. Character Depth: 1"; min. 1.5” at LED backlit signage
6. Finishes:

a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.

7. Mounting: Concealed, stainless-steel back bar or bracket assembly.

a. Hold characters flush to wall surface.

B. Backlit Dimensional Signage
1. Signage manufacturer to provide LED backlit letters with a minimum 1 ½” inch perimeter channels.
2. Mounting: Pre-finished standoffs (color to match letters) sized to allow adequate space between the letters and wall surface for backlighting and serviceability.
3. LED lights provided by the signage manufacturer per their recommendations.
4. Character heights as indicated on the drawings.

2.4 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Size as indicated on the drawings.

C. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.5 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.

2.6 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace signs for stability and for securing fasteners.
6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.7 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.8 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Back Bar and Brackets: Remove loose debris from substrate surface and install back bar or bracket supports in position so that signage is correctly located and aligned.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

SECTION 101423 - PANEL SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Panel signs.
2. Room-identification signs.
3. Vinyl letters applied to glass.

B. Related Requirements:

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image.
c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for signs.

2.2 SIGNS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Best Sign Systems, Inc.
2. Mohawk Sign Systems, Inc.
3. Seton Identification Products
4. ASI Sign Systems, Inc.
5. Contemporary Plastics, Inc.
6. Johnson Signs, Inc.
7. Fast Signs
8. Mills Manufacturing

9. Innerface
10. Dura Architectural Signage
11. Nelson Harkins
12. Cornerstone Signs
13. Signs International, Inc.
14. American Graphics, Inc.

B. Panel Sign.: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Basis-of-Design Product: ASI InTac.
2. Solid-Sheet Sign, Returns, and Back: Acrylic sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph below and as follows:

    a. Thickness: 0.125 inch (3.18 mm).
    b. Surface-Applied Graphics: Raised 1/32". text and graphics.

        1) Text: Font Helvetica Regular to meet ADA requirements.
        2) Inset, Cutout Characters: Sign face routed to receive push-through acrylic graphics to project 1/32" from the sign panel.

    c. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.
    d. Mounting: Concealed fasteners and adhesive unless noted otherwise on drawings.

3. Mounting: Surface mounted to wall with concealed anchors.
4. Surface Finish and Applied Graphics:

    a. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in color as selected by Architect from manufacturer's full range.
    b. Overcoat: Manufacturer's standard baked-on clear coating.

5. Text and Typeface: Accessible raised characters and Braille and Helvetica Regular. Finish raised characters to contrast with background color, and finish Braille to match background color.
6. Flatness Tolerance: Sign panel shall remain flat or uniformly curved under installed conditions as indicated and within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner.

2.3 PANEL-SIGN MATERIALS

A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

B. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.

C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 VINYL LETTERS APPLIED TO GLASS

A. 2 mil cast film, matching cut with pressure sensitive adhesive and integral colors. (As selected by Owner).

2.5 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. Sign Mounting Fasteners:

a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.

3. Inserts: Furnish inserts to be set by other trades into concrete or masonry work.

2.6 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace signs for stability and for securing fasteners.
6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.

C. Subsurface-Engraved Graphics: Reverse engrave back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.

D. Shop- and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.

E. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:

1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.
2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.
3. For frame to hold changeable sign panel, fabricate frame without burrs or constrictions that inhibit function. Furnish initial sign panel. Subsequent changeable sign panels are by Owner.

2.7 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that anchor inserts are correctly sized and located to accommodate signs.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls according to accessibility standard.

C. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

2. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423

SECTION 102600 - WALL PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Corner guards.

B. Related Sections:

1. Section 087100 "Door Hardware" for metal armor, kick, mop, and push plates.
2. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for surface-mounted corner guards.

1.3 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.

B. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: For each type of impact-resistant wall protection unit indicated.

1. Include similar Samples of accent strips and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below. Include Samples of accent strips to verify color selected.

1. Corner Guards: 12 inches (300 mm) long. Include examples of joinery, corners, top caps, and field splices.

1.4 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each impact-resistant plastic material.

B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.6 MATERIALS MAINTENANCE SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. 2 percent of each type, color, and texture of units installed, but no fewer than two, 8-foot-(2.4-m-) long units.
2. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two, 4-foot-(1.2-m-) long units.

B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Section 014000 "Quality Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.

E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.

2. Keep plastic sheet material out of direct sunlight.
3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).

    a. Store corner-guard covers in a vertical position.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures.
    b. Deterioration of plastic and other materials beyond normal use.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; extruded material, thickness as indicated.

1. Impact Resistance: Minimum 25.4 ft-lbf/in. (1356 J/m) of notch when tested according to ASTM D 256, Test Method A.
2. Chemical and Stain Resistance: Tested according to ASTM D 543.
3. Self-extinguishing when tested according to ASTM D 635.
4. Flame-Spread Index: 25 or less.
5. Smoke-Developed Index: 450 or less.

B. Polycarbonate Plastic Sheet: ASTM D 6098, S-PC01, Class 1 or 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft-lbf/in. (800 J/m) of notch when tested according to ASTM D 256, Test Method A.

C. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in ASTM B 221 (ASTM B 221M) for Alloy 6063-T5.

D. Stainless-Steel Sheet: ASTM A 240/A 240M.

E. Brass: ASTM B 249/B 249M for extruded shapes and ASTM B 36/B 36 M for sheet.

F. Particleboard: ANSI A208.1, Grade M-2.

G. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

2.2 CORNER GUARDS

A. Surface-Mounted, Resilient, Plastic Corner Guards.: Assembly consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. BALCO, Inc., Type CGS-3 or approved equal.
    b. Pawling Corporation
    c. Construction Specialties (www.c-sgroup.com)

2. Cover: Extruded rigid plastic, minimum 0.078-inch (2.0-mm) wall thickness; as follows:

    a. Profile: Nominal 2-inch-(50-mm-)long leg and 1/4-inch (6-mm) corner radius.
    b. Height: Top of guard shall be at 7'-4" above finish floor and terminate at top of resilient base..
    c. Color and Texture: As selected by Architect from manufacturer's full range.

3. Retainer: Minimum 0.060-inch-(1.5-mm-)thick, one-piece, extruded aluminum.
4. Retainer Clips: Manufacturer's standard impact-absorbing clips.
5. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

2.3 FABRICATION

A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

D. Miter corners and ends of wood handrails for returns.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.

B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings or, if not indicated, at heights indicated below:

a. Top of corner guard shall be at 7'-4" above finish floor and terminate at the top of resilient base..

2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.

a. Provide anchoring devices to withstand imposed loads.
b. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (305 mm).
c. Adjust top caps as required to ensure tight seams.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Public-use shower room accessories.
3. Hand dryers.
4. Custodial accessories.

B. Owner-Furnished, Contractor Installed Material: Soap Dispensers, Toilet Paper Dispensers, Sanitary Napkin Disposals, Paper Towel Dispensers, and Changing Tables. Refer to Enlarged Plans and Toilet Accessory Schedule.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.7 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Grab Bar.:

1. Basis-of-Design Product: Refer to Toilet Accessory Schedule in Drawings..
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.

    a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1-1/4 inches (32 mm).
5. Configuration and Length: As indicated on Drawings.

C. Mirror Unit.:

1. Basis-of-Design Product: Refer to Toilet Accessory Schedule in Drawings.
2. Frame: Stainless-steel angle, 0.05 inch (1.3 mm) thick.

    a. Corners: Welded and ground smooth.

3. Integral Shelf: 5 inches (127 mm) deep.
4. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.

    a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
    b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

5. Size: As indicated on Drawings.

2.3 CUSTODIAL ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Mop and Broom Holder.:

1. Basis-of-Design Product: Refer to Toilet Accessory Schedule in Drawings.
2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
3. Length: 36 inches (914 mm).
4. Hooks: 5.
5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No.4 finish (satin).

    a. Shelf: Not less than nominal 0.05-inch-(1.3-mm-) thick stainless steel.
    b. Rod: Approximately 1/4-inch-(6-mm-) diameter stainless steel.

2.4 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:

a. Portable fire extinguishers.

B. Related Requirements:

1. Section 104416 "Fire Extinguishers."
2. Section 211100 "Facility Fire-Suppression Water-Service Piping" for sizes, types, and finishes for hoses, hose valves, hose couplings, nozzles, and hose racks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Samples for Initial Selection: For each type of exposed finish required.

1.4 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.5 SEQUENCING

A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

B. Cabinet Construction: Nonrated.

C. Cabinet Material: Cold-rolled steel sheet.

D. Semi-recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.

E. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.

F. Cabinet Trim Material: Same material and finish as door.

G. Door Material: Steel sheet.

H. Door Style: Fully glazed panel with frame.

I. Door Glazing: Tempered float glass (clear).

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting door pull and friction latch.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

K. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
3. Door Lock: Cylinder lock, keyed alike to other cabinets.
4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.

a. Identify fire extinguisher in fire-protection cabinet with the words " FIRE EXTINGUISHER."

1) Location: Applied to cabinet door.
2) Application Process: Silk-screened.
3) Lettering Color: Red.
4) Orientation: Vertical.

L. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

a. Finish: Baked enamel or powder coat.
b. Color: As selected by Architect from full range of industry colors and color densities.

2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.2 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.3 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

1. Fire-Protection Cabinets: 54 inches (1372 mm) above finished floor to top of cabinet.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semi-recessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Requirements:

1. Section 104413 "Fire Protection Cabinets."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.4 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Multipurpose Dry-Chemical Type in Steel Container FE: UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS.

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 54 inches (1372 mm) above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 105113 - METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Welded corridor lockers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of metal locker.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.

B. Shop Drawings: For metal lockers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Show locker trim and accessories.
3. Include locker identification system and numbering sequence.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete masonry bases for metal lockers.

B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.
3. Warranty Period for Welded Metal Lockers: Lifetime from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain metal lockers and accessories from single source from single locker manufacturer.

1. Obtain locks from single lock manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.3 WELDED CORRIDOR LOCKERS Type A

A. Products: Subject to compliance with requirements, provide one of the following:

1. DeBourgh Mfg. Co.
2. American Locker Security Systems, Inc.
3. List Industries Inc.
4. Lyon Workspace Products
5. Medart
6. Penco Products, Inc.

7. Republic Storage Systems Co.

B. Product: 12" D x 18" W x 72" H (36" H per locker), double tier.

C. Doors: One piece; fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches (381 mm) wide; welded to inner face of doors.
2. Door Style: Vented panel as follows:

a. Louvered Vents: No fewer than three louver openings at top and bottom for double-tier lockers.

D. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:

1. Tops, Bottoms, and Sides: 0.060-inch (1.52-mm) nominal thickness.
2. Backs: 0.048-inch (1.21-mm) nominal thickness.
3. Shelves: 0.060-inch (1.52-mm) nominal thickness, with double bend at front and single bend at sides and back.

E. Frames: Channel formed; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.

F. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.

1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches (51 mm) high. Provide no fewer than three hinges for each door more than 42 inches (1067 mm) high.
2. Hinges: Manufacturer's standard, steel, continuous or knuckle type.

G. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks or padlocks; positive automatic latching and prelocking.

a. Latch Hooks: Equip doors 48 inches (1219 mm) and higher with three latch hooks and doors less than 48 inches (1219 mm) high with two latch hooks; fabricated from 0.120-inch (3.04-mm) nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

H. Locks: Built-in combination locks.

I. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch (9 mm) high.

J. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

K. Continuous Sloping Tops: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet, with a pitch of approximately 20 degrees.

1. Closures: Vertical-end type.

L. Filler Panels: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.

M. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

N. Finish: Baked enamel or powder coat.

1. Color: As selected by Architect from manufacturer's full range.

2.4 LOCKS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Locker Company; A Division of Master Lock Company, LLC.
2. Master Lock Company, LLC.
3. Zephyr Lock LLC.

B. Built-in Combination Locks: Key-controlled, three-number dialing combination locks; capable of at least five combination changes made automatically with a control key.

2.5 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. Equipment: Provide each locker with an identification plate and the following equipment:

1. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.

D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.

E. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.

F. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

1. Sloping-top corner fillers, mitered.

G. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

H. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

2.6 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top and bottom of lockers.

B. Welded Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.

C. Equipment:

1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates: Identify metal lockers with identification indicated on Drawings.

    a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
    b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.

D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
2. Attach sloping-top units to metal lockers, with closures at exposed ends.
3. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

3.4 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 105300 - ALUMINUM PROTECTIVE CANOPIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of work includes all labor, material, equipment and related items required for the installation of "Aluminum Protective Canopies" as shown on the drawings and specified herein.

1.3 QUALITY ASSURANCE:

A. Materials and finishes shall meet or exceed recommended ASTM, Military and Federal Test methods specified by the Aluminum Association in their publication "Aluminum Standards and Data, current edition.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product data and installation instructions for each type of canopy specified.

B. Samples for Initial Color Selection: Manufacturer’s color charts showing a full range of available colors.

C. Samples for Color Verification: Sample showing actual colors prepared on same material to be used for the work.

D. Shop Drawings: Submit shop drawings for components and installation which are fully dimensioned or detailed on manufacturer's data sheets. Provide stamped calculations and drawings to verify wind, rain and snow loads upon canopies and supporting struts from Kentucky Registered Professional Engineer.

Engineering Calculations: Submit engineering calculations to confirm that complete canopy assembly complies with all applicable building codes for dead, snow, rain, wind loads, etc. Calculations and shop drawings shall be stamped and signed by a Kentucky licensed professional structural engineer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Subject to compliance with requirements, provide products of one of the following or approved equal:

1. Alcan Aluminum Canopies
2. Mapes Industries, Inc.
3. E.L. Burns Company, Inc.
4. American Aluminum Products Company.
5. Perfection Metal and Supply Company.
6. Peach Tree Protective Covers
7. Superior
8. Tennessee Valley Metals (Basis-of-Design)

2.2 CONSTRUCTION:

A. Door Canopy: Louver leaves shall be .075” minimum walled aluminum with a three-inch minimum rib height, flush deck. Fascia gutter shall be a structural 7” minimum .094 walled extruded tube. Two-piece fascia shall not be accepted. Overhead supports shall be a heavy-duty extruded prefinished tube aluminum strut supports, minimum deck rib height to be 3”. Galvanized steel struts will not be accepted. Downspouts to be galvanized steel: 22 gauge. Provide galvanized metal strainers at the highest end of all downspouts. Provide 16 ga galvanized steel downspout straps 1” x 2” at downspouts, Finish shall be factory applied 70% by weight Kynar resin in a custom color as selected by owner.

2.3 PROTECTIVE COATING:

A. All ferrous fasteners and hanging accessories shall be heavily galvanized or cadmium plated. All louvers, gutters and fascia to be caustic etched and alumilited.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install canopies at locations shown in accordance with enlarged details and manufacturer's instructions for plumb, level, rigid and flush installation.

END OF SECTION 105300

SECTION 114000 – FOOD SERVICE EQUIPMENT

1. SCOPE

General provisions of Contract, General and Supplemental Conditions, and General Requirements apply to this section. And, this section shall be governed by alternates insofar as they affect this work. This includes, but is not limited to jobsite measurements, trade coordination and supplying equipment as specified.

2. DESCRIPTION

A. Related work specified elsewhere:
    1. Instructions to bidders, general and supplementary conditions.
    2. Drawings and project data.
    3. Mechanical and electrical work.

B. "Food Equipment Contractor" or the abbreviation FEC, or the term bidder, means the person, company or corporation that will contract for the work specified in this section.

C. Food Equipment Contractor's Work includes:
    1. All labor, materials and equipment necessary for complete installation of the food service and related equipment as indicated in these documents.
    2. Delivery, unloading, storing, assembly and setting in place of the specified equipment, ready for final connections by others.
    3. Delivery of all loose fittings to other trades and coordination of same, (faucets, valves, etc.)
    4. Reasonable protection of all equipment from damage until owner acceptance.
    5. Inspection to see that all rough-ins and connections to all mechanical, electrical, ventilation, and refrigeration equipment are made according to the intent of these specifications. If FEC drawings and other submittals are in conflict with the engineering and architectural bid documents, work should not proceed until clarified by the architect.
    6. Mechanical work by FEC:
        a. remote refrigeration lines
        b. furnish faucets and wastes and overflows as specified for installation by mechanical contractor
    7. Electrical work by FEC:
        a. All combination starter/junction boxes where required per rules, regulations and codes and where part of the equipment and/or as specified with direction for installation.
        b. All electrically operated equipment; all wiring terminating in junction boxes, combination starters and/or control panels ready for final connection by Electrical Contractor.
        c. Receptacles specified as part of equipment and all required cords and plugs as specified.

3. QUALITY ASSURANCE

A. Qualifications: Bidder shall have engineering personnel and facilities to design, detail and fabricate quality food facilities equipment of type and size used on this project.

B. Requirements of Regulatory Agencies:
    1. Comply with and bear seal of National Sanitation Foundation, Underwriter's Laboratories, and/or National Board of Fire Underwriters
    2. O.S.H.A.

4. SUBMITTALS
   A. General Procedures:
      1. Shop and Rough-in Drawings for approval, four (4) sets of prints; 8 copies for distribution after approval OR number as directed by the architect or general contractor.
      2. Maintenance manuals: Three (3) bound sets.
   B. Shop Drawings for custom fabricated equipment are to consist of a plane view, elevation, and section view of each item of equipment. Drawings shall be at a minimum scale of ¾" = 1'-0".
   C. Rough-in Drawings are to consist of the following sheet respectively. Floor plan showing equipment and item number, drawn at ¼" = 1'0" scale. All wall line dimensions are to be taken from architect's drawing to insure exact wall line dimensions. Should discrepancies occur, note these to Architect when submitted.
   D. Equipment Brochures are to contain all information as listed below and assembled with the Item specification sheet [manufacturer's cut sheet] with all accessory items and mechanical requirements underlined or highlighted.
   E. Maintenance Manuals: Instructions for maintenance of food equipment, including the following:
      a. Care of finished surfaces
      b. Material Safety Data sheets
      c. Period of warranty and list of service agencies responsible for each item of equipment.

6. SUBSTITUTIONS
   A. Equipment items specified have been chosen for size, specific mechanical, physical and maintenance advantages. In all possible cases, there have been three brands listed as approved. It is the intent that these minimum requirements be met. If substitutions are proposed, they must be submitted and approved ten (10) days prior to bid date, and listed on an addendum provided to all contractors of record. All requests for approval of submitted items must be submitted as follows:
      1. Submittal must be in writing and be in possession of owner's agent prior to ten (10) working days of bid date. Submittal request must contain mechanical and electrical information (connected loads and points of connection). No consideration will be given to substitution requests without this information.
      2. Approvals for substituted items will be listed in an addendum and sent to bidders of record. Items substituted, but not listed on addendum will be cause for rejection of bid.

7. WARRANTY
   A. FEC shall warranty all equipment furnished under this contract against defects in material and workmanship for a minimum period of one (1) year, UNLESS specifically specified or if the standard factory warranty is longer than one year. All buy-out equipment shall have a factory warranty covering one year parts and labor. Warranty shall go into effect on date of substantial completion or date put into use by Owner, whichever is sooner.
   B. Sealed refrigeration units shall be warranted for five (5) years.
   C. Owner is not responsible for and expenses involved in servicing of any item furnished under this contract unless it can be shown that said items were misused by Owner or that service call was not necessary.

D. The owner will ask only the FEC for any warranty service or repair and shall not be expected to direct any calls to any other agency for the FEC. Owner calls to other sources may void factory warranties and such costs may be borne by the owner.
E. Owner shall have continued use of defective equipment until replacement is delivered.

9. PRODUCTS

A. Materials
    1. Sheet Metal (all U.S. Standard Gauges):
        a. Stainless Steel, type 302/304 (Type 430 not acceptable) Minimum finish, #3 or 100 grit.
        b. Galvanized Steel, tight coat galvanized copper nearing steel.
    2. Sound Deadening: 1/8" thick mastic painted with aluminum paint under all tops. Mastic equal to 3M – E.C. coating #1000.
    3. Sealant: Silicone type, standard clear.
       (Dow Corning 781 or General Electric approved for use in foodservice)
B. Faucets, Spray Units and Accessories shall be T&S Brass, Fisher Faucets, Chicago Faucets or equal
    1. Chrome plated, heavy duty brass, equipped with removable seals and with removable aerators.
    2. All pre-rinse units mounted on table top to be equipped with wall mounting bracket on riser pope and secured to wall with screw or bolts.
    3. All vacuum breakers to be chrome plated above table in backsplash.
C. Fabrication
    1. General: Where fabrication disturbs the original finish, material shall be polished to match original finish and all corners formed or welded on minimum ½" radius.
    2. Welding- All welds shall be nonporous and free from any imperfections, homogeneous with material itself. Welds shall be radius type ground smooth, integral and polished.
    3. Legs, cross rails, gussets and feet on open base tables and sinks, material as specified, 1-5/8" O.D. tubing 16 gauge minimum including crossbraces.
    4. Table/Counter Tops.
        a. All tops shall be of 14 gauge stainless steel one (1) piece construction with all seams and corners welded.
        b. All intersections of three (3) or more planes coved.
        c. Reinforced with 4" x 1" inverted 14 gauge galvanized steel channels with 1" flanges, stud welded to underside of tops. There shall be two channels running lengthwise under tops up to 30" wide, and one (1) channel running front to rear at legs and/or not more than 6'-0" on center.
        d. Tops and backsplashes free of screws, rivets and/or bolts.
        e. All open corners of edges welded in bull-nose roll.
    5. Sink Section Tops - Identical to table tops, Paragraph D with the following exceptions:
        1. Tops shall slope to sinks, troughs and drainboards a minimum of 1/8" per foot.
        2. Backsplashes and table edges shall be level.
        3. All sinks, disposer cones, sumps, chutes or trough shall be integrally welded with top to give one (1) piece appearance.
    6. Drawers - 20" x 20" x 5" deep, 18 gauge stainless steel removable pans, easily removable without removing frame.

7. Elevated Shelves – Constructed with minimum 14 gauge stainless, unless otherwise specified. Shelves shall be level and plumb, underbraced same as tops herein before specified.
8. Sink Bowls, Sink Sections,
    a. 14 gauge stainless steel all welded, size and shape, as shown.
    b. Backs, bottoms and fronts are to be formed of one continuous sheet of stainless steel with ends welded.
    c. Intersections coved and welded.
    d. Shall have integral welded backsplash.
    e. Waste, as specified in itemized specifications.
    f. Drainboards shall be integral with sinks of same material, mounted on two legs and slope to sinks, minimum 1/8" per ft.
    g. Depth of sink bowls shall refer to distance between intersection of top of sink to drainboard surface and bottom of sink, excluding slope to drain.

10. REFRIGERATION

A. General. Provide refrigeration condensing units of size and capacities as indicated, consisting of compressors, condensers, receivers, motors, mounting bases, vibration isolators, refrigeration components, safety devices, electrical controls, refrigerant and protective controls, ALL FACTORY ASSEMBLED and tested.
    1. Refrigerant: Charge units with refrigerant. Refrigerant to be most current type that is approved for use under the Montreal Protocol, and in accordance with the 2009 EPA Federal Clean Air Act and 2009 revised guidelines of the EPA pertaining to new walk-in cooler and freezer construction after January 1, 2009. R-12 and R-502 will not be acceptable. Condensing units shall be semi-hermetic or scroll construction, capable of being field converted to newer types of refrigerant as they are developed.
    2. Outdoor Mounting. Provide weather-tight housing, and low ambient controls for all units located outdoors.

B. Equip each compartment with the necessary lighting to provide a minimum of twenty (20) foot candles of light at any point thirty inches above the floor. Lights are to be mounted on the interior of each compartment. For extra lights specified or required, provide all hardware and deliver to the electrical contractor for installation.

C. Provide digital or two inch diameter chrome-plated dial thermometer, flush mounted on the exterior wall with sensor bulb mounted and protected in an appropriate design location, unless otherwise specified.

D. Doors shall be complete with stops, piston-actuated self-closing mechanisms, inside safety releases and key-locking devices. Provide full perimeter door heaters on freezer doors, including under factory-manufactured sills. Where building floor becomes the walk-in floor or is level with it, doors shall be hung on chrome-plated, camlift hinges such that the doors shall be self-closing from all angles.

E. All interior corners and intersections shall be coved for easy cleaning.

F. Provide timed, programmable defrost controls for freezer coils.

G. Condensate drain lines shall be furnished and installed by the FEC. Insulate all drain lines with 3/4" pre-molded foamed insulation. Provide heater coil or tape on all freezer drain lines, pre-wired with effective shelving design. Use hard copper for all drain lines, sized and sloped as required for good drainage, complete with traps over exterior drains.

H. Refrigerant piping shall be Type ACR hard temper copper tubing with wrought fittings and silver solder joints. <u>Insulate all suction lines with ¾" pre-molded foam insulation.</u>

I. Provide all control wiring between condensing unit and coil. The electrical contractor shall make final connections from the disconnect to the condensing unit.
J. Provide all specialty parts for dryer, filters and pump down controls for a proper installation.

11. EXECUTION

A. Inspection

1. Inspect all submittals to see that they do not conflict with documents published by Consultant/Architect/Owner.
2. The FEC is responsible for verifying all dimensions, quantities, construction details, finished, sizes, etc.
3. Field check locations and sizes of all rough-ins prior to installation of finished floors, walls and ceilings to verify that said rough-ins are in correct position and where shown on FEC's drawings.

B. Specifications for other contractors to make final electrical, water, waste and ventilating connections, unless otherwise specified.

1. The duties of the FEC in relation to other trades: The FEC shall coordinate all information relating to FEC's equipment required by other trades.
2. All equipment resting against walls, floors, ceilings, masonry bases and/or other equipment shall be sealed with silicone sealer, as specified.
3. The FEC is responsible during the progress of the project for protection of his equipment against fire, theft, damage, etc., until date of final acceptance by Architect.

C. Testing, Demonstration, Instruction

1. After utility connections have been made to all equipment, FEC shall conduct final tests of equipment in the presence of the Consultant/Owner and/or their duly authorized representatives to insure that all equipment will be ready for Owner operation when required.
2. The FEC shall thoroughly instruct Owner and/or Owner's duly authorized representative in the operation of all equipment, item by item, including fabricated equipment.
    a. Instruction shall include the care and cleaning of all equipment and a complete demonstration of operation.
    b. The FEC's installation supervisor is required to be at the project during normal working hours the first day of complete Owner operation to assist Owner in complete operation.
3. The FEC shall deliver three (3) sets of maintenance manuals as specified to Owner or Owner's duly authorized representative and shall thoroughly instruct owner in the complete contents of said manuals.

D. Cleaning

1. All trash material caused by FEC's installation shall be removed by the FEC from the project site daily.
2. Before final inspection and Owner operation of facility, the FEC shall remove all protective coverings from his equipment and thoroughly clean and service all items.

Specification Section

Please note that the following brands and model numbers have been specifically selected to serve a specific purpose on this project and conform to established utility requirements. Do not provide any alternate brands unless specifically approved in writing. Provide quantity of items as shown in the drawing or mentioned specifically in the written descriptions.

ITEM 1 - CASH REGISTER STAND (1 REQ'D)
Low Temp Industries
Model 36-CSE
SpecLine Cashier Station, single end station, 36-3/8"W x 30"D x 36"H, 14ga stainless steel top, specify base, 5" casters all with brakes, UL, cUL, UL EPH

1 ea.	Molded fiberglass
1 ea.	Custom color
1 ea.	(AA) Line up lock
1 ea.	3" Knock-out on top
1 ea.	(DD) flush mount outlet
1 ea.	(A) Solid tray slide with (2) inverted "V" ridges on surface, stainless steel

All serving line components shall be the same manufacturer.

Delfield and Multiteria will be accepted as an equal manufacturer provided the provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 2 - SERVING COUNTER, UTILITY (1 REQ'D)
Low Temp Industries
Model 36-ST
SpecLine Solid Utility Food Table, 14ga stainless steel top, 36-3/8"W x 30"D x 36"H, specify base, rear storage opening, 5" casters all with brakes, UL, cUL, UL EPH

1 ea.	Molded fiberglass
1 ea.	(AA) Line up lock
1 ea.	Custom color
1 ea.	(A) Solid tray slide with (2) inverted "V" ridges on surface, stainless steel
1 ea.	(D) Cutting board, stainless steel

All serving line components shall be the same manufacturer.

Delfield and Multiteria will be accepted as an equal manufacturer provided the provided the product conforms to the dimensions, construction, design, capacity and function of the basis of design.

ITEM 3 - SERVING COUNTER, COLD FOOD (1 REQ'D)
Low Temp Industries
Model 60-CFMA
SpecLine TempestAir Cold Serving Counter, 60-3/8"W x 30"D x 36"H, 14ga stainless steel top with (1) 51"W x 20"D x 9" deep stainless-steel cold well, accommodates (4) full size 6" deep flush mounted food pans, forced air refrigeration with (2) fans, specify base, 5" casters all with brakes, 1/3 HP, UL, cUL, UL EPH

1 ea.	120v/60/1-ph
1 ea.	Molded fiberglass

1 ea. Custom color (one charge for entire serving line)
1 ea. (AA) Line up lock
1 ea. (A) Solid tray slide with (2) inverted "V" ridges on surface, stainless steel
1 ea. (D) Cutting board, stainless steel
1 ea. (CP) Crystal Clear convertible protector
1 ea. Model CCSB60 CrystalClear Single Buffet Protector, self-service, one section 57-3/4" long, 3/8" tempered glass with penciled edges & bumped corners, tubular supports and LED lights
1 ea. Sheet pan recess

All serving line components shall be the same manufacturer.

Architect may select a Custom RAL color for body finish.

Body shall have a 5-year manufactures Construction Warranty
2-year parts and labor and a 5-year compressor warranty

Delfield and Multiteria will be accepted as an equal manufacturer provided the provided the product conforms to the dimensions, construction, design, capacity and function of the basis of design.

ITEM 4 -HOT FOOD SERVING COUNTER / TABLE (1 REQ'D)
Low Temp Industries
Model 84-EFS5-CPA
SpecLine Hot Food Serving Counter, 84-3/8"W x 30"D x 36"H, (5) 12" x 20" hot wells, wet & dry operation, individual digital controls, 14ga stainless steel top, specify base, rear storage openings, (6) 5" locking swivel casters, UL, cUL, UL EPH Classified
1 ea. 120/208v/60/1-ph,
1 ea. Molded fiberglass
1 ea. Custom color
1 ea. (Z) Hot food drains
1 ea. (AA) Line up lock
1 ea. (A) Solid tray slide with (2) inverted "V" ridges on surface, stainless steel
1 ea. (D) Cutting board, stainless steel
1 ea. (CP) Crystal Clear convertible protector
1 ea. Model CCSB84OF CrystalClear Single Buffet Protector, self-service, 81-3/4" long divided into two sections (47-7/8" & 33-7/8" bays), 3/8" tempered glass with penciled edges & bumped corners, tubular supports.
1 ea. Sheet pan recess
1 ea. 5" Casters

All serving line components shall be the same manufacturer.

Architect may select a Custom RAL color for body finish.

Body shall have a 5-year manufactures Construction Warranty
2-year parts and labor and a 5-year compressor warranty

Delfield and Multiteria will be accepted as an equal manufacturer provided the provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 5 - MILK COOLER (1 REQ'D)
Beverage Air
Model SM58HC-S

School Milk Cooler, cold wall, normal temperature, 58"W x 30-5/8"D x 41-1/8"H, 22.63 cu. ft., single access, flat top carton capacities, (16) 13" x 13" x 11" or (10) 19" x 13" x 11" case capacity, self-latching doors/lids with safety bumpers, cylinder lock, wire floor racks, floor drain, electronic control, manual defrost, stainless steel interior & exterior, R290 Hydrocarbon refrigerant, 1/3 HP, cULus, UL EPH Classified, UL-Sanitation, Made in USA

1 ea. 3 years parts & labor warranty (excludes maintenance items)
1 ea. Self-Contained refrigeration
1 ea. Additional 4 years compressor warranty (part only), standard
1 ea. 115v/60/1-ph, 2.2 amps, cord with NEMA 5-15P
1 ea. 4" Heavy duty casters, (2) with brakes, standard

TRUE and TRAULSEN will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 6 - FLATWARE & TRAY CART (1 REQ'D)
Lakeside Manufacturing
Model 213
Tray & Silver Cart, tubular U-frame with lower platform tray storage & top rack, accepts ten (10) flatware cylinders (not included), for (130) 16" x 22" trays, 500 lb. load capacity, 5" non-marking cushion tread casters, all stainless-steel construction, Made in USA

CADDY and IMC TEDDY will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity and function of the basis of design.

ITEM 7 - DISHTABLE, SOILED "L" SHAPED (1 REQ'D)
LTI INC
Model: Custom
Provide shape and size per drawing, High Top - 14 ga. Stainless Steel with Backsplash, Sound Deadening Spray On & Paint, 3" High Rolled Rim Edge, Backsplash "Z" Clips, 3" High Rolled Rim Corner Turn, Backsplash Corner Turn, stainless steel Underbracing, 1-5/8 Inch Stainless Steel Leg and Gusset on stainless Channel, Adjustable S/S Bullet Feet, 18 Gauge Fixed Undershelf 21" x 21" x 5" Deep Integrally Welded Pre-Rinse Sink With Weld-In Disposer Ring, Stainless Steel Rack Guides over Pre-Rinse Sink, Pass thru window-sill with inverted "V" outer edge with Jamb and Header, Dishwasher Lip, (1) T&S Brass B-0133-B Pre-Rinse Unit, (1) B-0230-K Installation Kit,

All custom fabrication shall be the same manufacturer.

Missouri Equipment Company, Commercial Stainless and IMC Teddy, will be accepted as an equal manufacturer provided the provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 8 - DISPOSER (1 REQ'D)
InSinkErator
Model SS-200-7-CC101
SS-200™ Complete Disposer Package, sink mount system, 6-5/8" diameter inlet, with #7 collar adaptor for sink installation, 2 HP motor, stainless steel construction, includes syphon breaker, solenoid valve, flow control valve, programmable CC-101 control center, auto reversing, timed run, post flush, adjustable leg kit.

1 ea. (1) year parts & labor warranty from date of installation (standard)
1 ea. Standard height disposer body
1 ea. 208v/60/3-ph, 3.6 amps
1 ea. T&S BRASS B-01455

SALVAJOR and MASTER DISPOSER will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 9 - HOSE REEL (1 REQ'D)
T&S Brass
Model B-7222-C01XS1E
Hose Reel Assembly, enclosed, 3/8" x 30 ft. hose with high flow blue spray valve with swivel (EB-0107), 8" wall mount mixing faucet, quarter-turn Eterna compression cartridges with spring checks, lever handles with color coded indexes, continuous pressure vacuum breaker, 3/8" NPT x 36" flexible water hose connector with stainless steel quick disconnect, ratcheting system, multi-fit bracket & adjustable hose bumper, (2) 2-3/8" wall brackets, EasyInstall 16" & rigid 40" risers, epoxy coated steel hose reel, polished chrome-plated brass faucet body, 1/2" NPT female inlets

1 ea.	1-year limited warranty, standard
1 ea.	1-year limited warranty for hose, standard
1 ea.	2-year limited warranty for hose reel, standard
1 kt	Model B-0230-K Installation Kit, (2) 1/2" NPT nipples, lock nuts & washers, (2) short "Ell" 1/2" NPT female x male

FISHER and KROWNE will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity and function of the basis of design.

ITEM 10 - DISHWASHER, CONVEYOR TYPE (1 REQ'D)
Hobart
Model CL44EN
Conveyor Dishwasher, single tank, (202) racks/hour, insulated hinged doors, .62 gallon/rack, stainless steel enclosure panels, microprocessor controls with low temperature & dirty water indicators, NSF Pot & Pan mode, programable de-lime notification, ENERGY STAR®, factory startup.

1 ea.	Standard warranty - 2-Year parts and Labor
1 ea.	Model CL44EN-BASHTE15K Electric tank heat 15kW
1 ea.	Model CL44EN-BASERH30K 30kW electric booster
1 ea.	Dual Point (2) service connection standard
1 ea.	Model CL44EN-BASELE0AX 208v/60/3-ph
1 ea.	Model CL44EN-BASHGTHTS Higher than standard
1 ea.	Model CL44EN-BASDIR0RL Right to left operation.
1 ea.	Model CL44EN-BASFETSTD Standard feet
2 ea.	Model VNTHD/E-ADJ E-series vent hood domestic (adjustable)
1 ea.	Model CLE/TBL-SWITCH Table limit switch CLE-Series

MEIKO and CHAMPION will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the specified Basis of Design.

ITEM 11 - DISHTABLE, CLEAN (1 REQ'D)
LTI INC
Provide shape and size per drawing, High Top - 14 ga. Stainless Steel, Backsplash, Sound Deadening Spray On & Paint, 3" High Rolled Rim Edge, Backsplash, "Z" Clips, 3" High Rolled Rim Stainless Steel Underbracing, 1-5/8 Inch Stainless Steel Leg and Gusset on Galv. Channel Adjustable S/S Bullet Feet,16 Gauge Fixed Undershelf, Limit Switch Provisions, Dishwasher Lip

All custom fabrication shall be the same manufacturer.

Missouri Equipment Company, Commercial Stainless and IMC Teddy, will be accepted as an equal manufacturer provided the provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 12 - SINK, (3) THREE COMPARTMENT (1 REQ'D)
LTI INC
Model: Custom
Refer to Drawings approx. 114” x 30” x 36” High Pot Sink- with 2” 45 degree Return splash and 3” High Rolled Rim, Pot Sink-Drain Boards, Pot Sink Back Splash w/ bracing, Pot Sink-Drain Board under Bracing Galvanized, 1 5/8 inch Stainless Steel Sink Leg and Gusset on galvanized plate, 1-5/5 inch Stainless Steel Drain board leg and gusset on galvanized channel, Sound deaden sink bowls with spray on mastic and paint, Sound deaden drain board with spray on mastic and paint, Pot Sink-Standard Partition, Backsplash “Z” Clips, Adjustable S/S Bullet Feet, 1-5/8” Dia. Stainless Steel Cross Rails, 18 Gauge Fixed Undershelf, Lever waste With Overflow. (2) T&S BRASS B-0290-01 Big-Flo Mixing Faucet, wall mount, 8" adjustable centers, 16" swing nozzle with plain end outlet, lever handles with color coded indexes, low-lead, ¾“female NPT, ANSI, NSF, ADA Complaint

1 ea.	T&S Brass Model B-0133-01 EasyInstall Pre-Rinse Unit
1 ea.	T&S Brass Model B-0231-EE Sink Mixing Faucet

All custom fabrication shall be the same manufacturer.

Missouri Equipment Company, Commercial Stainless and IMC Teddy, will be accepted as an equal manufacturer provided the provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 13 - ICE MAKER, CUBE-STYLE (1 REQ'D)
Manitowoc
Model IYT0450A
Indigo NXT™ Series Ice Maker, cube-style, air-cooled, self-contained condenser, 30"W x 24"D x 21-1/2"H, production capacity up to 490 lb/24 hours at 70°/50° (378 lb AHRI certified at 90°/70°), easyTouch display with 13 different language options, date/time stamp display, automatic reminder/alert icon, one touch asset information, automatic detection of accessories, continuous operating status, programmable production options (time, weight, day or night), one touch cleaning with displayed instructions, Alpha-San anti-microbial protection, acoustical ice sensing probe, self-diagnostic technology, DuraTech™ exterior, half-dice size cubes, R410A refrigerant, NSF, cULus, CE, ENERGY STAR®

1 ea.	Model WARRANTY-ICE-SC 3-year parts & labor (Machine), 5-year parts & labor (Evaporator), 5-year parts & 3 years labor (Compressor)
1 ea.	Model SFA292 Vending Ice Dispenser with Built-In Water Valve, touchless lever, floor model,
1 ea.	Model WARRANTY-BIN/DISP 3-year parts & labor warranty.
1 ea.	3M Purification Model ICE125-S (5616004) 3M™ Water Filtration Products Water Filter System, with gauge

SCOTSMAN and HOSIHZAKI will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 14 - FLOOR DRAIN (1 REQ'D)
IMC/Teddy
Model FDSS-1212-SGAS

FDSS Floor Drain Sump Sink, 12"W x 12"D x 4" deep, 16/304 stainless steel, with drain & (SGAS) anti-slip subway grating, delivered to Plumbing Contractor for installation.

CUSTOM FABRICATORS will be accepted as an equal manufacturer provided the provided the product conforms to the dimensions, construction, design, capacity and function of the basis of design.

ITEM 15 - BUSSING UTILITY TRANSPORT CART, METAL (4 REQ'D)
Lakeside Manufacturing
Model 244
Utility Cart, 3-shelf with 36"W x 22"D x 40-5/8"H, shelf size 33"W x 21"D, stainless steel tubular U-frame, 20-gauge stainless steel shelves with reinforced edges, 500 lb. capacity, 10-3/4" shelf clearance, push handle on each short side, 5" non-marking cushion thread swivel casters, NSF (ships fully assembled), Made in USA
4 ea. Casters, 5", all swivel, No-Mark, cushion tread, standard

CADDY and STEROSIL will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity and function of the basis of design.

ITEM 16 - MOBILE HEATED CABINET (2 REQ'D)
Winston Foodservice
Model HOV5-14UV
CVap® Holding Cabinet, mobile, full-size, insulated, convection holding, accommodates (14) 18" x 26" sheet pans or (28) 13" x 18" sheet pans or (28) 12" x 20" hotel pans, load limit 65 lbs (29.25 kg) per rack, (2) field reversible hinged solid dutch doors, magnetic door handle, C-Touch control with processor, HACCP temperature downloads, USB & audio ports, manual water fill, stainless steel interior & exterior, CE, UL EPH ANSI/NSF4, cUL, UL-Sanitation
2 ea. 1-year warranty
2 ea. 120v/60/1-ph,
2 ea. Second set of doors on back of cabinet, windows in all doors
2 ea. Right hand hinging front
2 ea. Left hand hinging rear.

CRESCOR and ALTO SHAM will be accepted as an equal manufacturer provided the provided the product conforms to the dimensions, construction, design, capacity and function of the basis of design.

ITEM 17 - WORKATBLE, STAINLESS STEEL (1 REQ'D)
LTI INC

ITEM 18 - PASS-THRU REFRIGERATOR (1 REQ'D)
Traulsen
Model AHT232WPUT-FHS
Spec-Line Refrigerator, Pass-thru, two-section, self-contained refrigeration, StayClear™ Condenser, stainless steel exterior, aluminum interior, standard depth, wide full-height door or doors with Santoprene® EZ-Clean Gaskets, (3) adjustable wire shelves per section, microprocessor controls, 6" adjustable stainless-steel legs, 5/8 HP, cULus, NSF
1 ea. 6-year parts & labor and 7-year compressor
1 ea. 115v/60/1-ph, 8.6 amps, with cord & NEMA 5-15P, standard
1 ea. Standard refrigerant, standard
1 ea. Full height solid door, standard
1 ea. Full height solid door, standard

1 ea.	Full height solid door, standard
1 ea.	Full height solid door, standard
1 ea.	Thermometer side: Left door hinged left/right hinged right.
1 ea.	Rear: Left door hinged left/right hinged right.
28 ea.	Universal tray slide - per pair

UTILITY and DELFIELD will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity and function of the basis of design.

ITEM 19 - EXHAUST HOOD SYSTEM (1 REQ'D)
KTECH
Model 6014080
By Others

ITEM 20 - COMBI OVEN, ELECTRIC (1 REQ'D)
RATIONAL
Model ICP 6-FULL ON 10-FULL E
One (1) (CC1ERRA.0000218) iCombi Pro® 6-Full Size Combi Oven on one (1) (CE1ERRA.0000221) iCombi Pro® 10-Full Size Combi Oven, double stack, electric, (16) 18" x 26" sheet pan or (32) 12" x 20" steam pan or (16) 2/1 GN pan capacity, (8) stainless steel grids included, intelligent cooking system with (4) assistants; iDensityControl, iCookingSuite, iProductionManager, & iCareSystem, (6) operating modes, (5) cooking methods, (3) manual operating modes, 85° to 572°F temperature range, quick clean, care control, eco mode, 6-point core temperature probe, retractable hand shower, Ethernet interface, Wi-Fi enabled, 208/240v/60/3-ph, 22.4/37.4 kW, CE, IPX5, UL, cULus, NSF, ENERGY STAR-®

1 kt	Model 60.74.725 Combi-Duo Stacking Kit
1 ea.	2 years parts and labor, 5 years steam generator warranty
1 ea.	Model CAP Chef Assistance Program, a RATIONAL certified Chef conducts 4 hours/location specialized application training with personnel,
2 ea.	Model 9999.2100 Commissioning
2 ea.	Installation kits - One (1) for each iCombi is required.
1 ea.	Model 8720.1563US Installation Kit
1 ea.	Model 8720.1554US Installation Kit,
1 ea.	Model 1900.1150US Water Filtration Double Cartridge System, for full-size Combi-Duos
2 ea.	Model 56.01.535 Active Green Cleaner Tabs, for all iCombi Pro/Classic, 150 pieces/bucket
2 ea.	Model 56.00.562 Care Tabs, bucket of 150 packets
8 ea.	Model 6010.2101 Gastronorm Grid Shelf, 2/1 size, 25-5/8" x 20-7/8", stainless steel.
12 ea.	Model 6019.1150 CombiFry Basket, 1/1 GN, 12-3/4" x 20-7/8"

CONVOTHERM and ALTO SHAM will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity and function of the basis of design.

ITEM 21 - SPARE NO.

ITEM 22 - MICROWAVE OVEN (1 REQ'D)
ACP
Model HDC182

Amana® Commercial Microwave Oven, 0.6 cu. ft. capacity, 1800 watts, heavy volume, 4-stage cooking, (11) power levels, (100) memory settings, 60-minute max cooking time, LED display, touch control, interlock safety switch, ADA-compliant Braille touch pads, audible end of cycle signal, side hinged door with tempered glass, sealed ceramic interior shelf, lighted interior, stainless steel exterior & interior, 208-240v/60/1-ph, 14.4 amps, 20 MCA, 3000 watts (total), NEMA 6-20P, cETLus, ETL-Sanitation
1 ea 3-year full warranty, standard

PANASONIC and VOLLRATH will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity and function of the basis of design.

ITEM 23 - HOT WATER DISPENSER (1 REQ'D)
BUNN
Model 26300.0001
26300.0001 H10X Hot Water Dispenser, up 24 gallons/per hour, 212°F temperature setting, upper faucet, includes dry-plug prevention, stainless steel, 208v/50/60/1-ph, 38.7 amps, 8,050 watts, UL, NSF

HATCO and BLOOMFIELD will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity and function of the basis of design.

ITEM 24 - WORKTABLE, STAINLESS STEEL (1 REQ'D)
LTI INC
Refer to drawings Approx. 30" x 30" x 34" High, Top - 14 ga. Stainless Steel, Pitched Marine Edge, Sound Deadening Spray On & Paint, Pitched Marine Corner Turn, Galv. Underbracing, 1-5/8 Inch Stainless Steel Leg and Gusset on Galv. Channel, 5 Inch Locking Casters, 18 Gauge Fixed Undershelf,

All custom fabrication shall be the same manufacturer.

Missouri Equipment Company, Commercial Stainless and IMC Teddy, will be accepted as an equal manufacturer provided the provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 25 - CONVECTION OVEN, ELECTRIC (1 REQ'D)
Vulcan Model VC55ED Dimensions: 68.6(h) x 40.1(w) x 40(d)
Convection Oven, electric, double-deck, standard depth, solid state controls, 5-hour timer with digital display enhancement, 150° to 500°F temperature range, (5) oven racks per deck, independently operated removable doors with double pane windows, porcelain on steel interior, interior light, stainless steel front, top, & sides, painted 8"H legs, (2) 1/2 HP blower motors, 25.0kW, NSF, UL, ENERGY STAR®
1 ea 2-year limited parts & labor warranty,
2 ea (2) 208v/60/3-ph, standard

GARLAND and SOUTHBEND will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 26 - KETTLE, ELECTRIC, COUNTERTOP (1 REQ'D)
Cleveland Range
Model TKET12T
Tilting Kettle, electric, twin unit, countertop, 12-gallon (45L each) capacity each, 2/3 steam jacket design, self-contained, lever style-tilting, anti-drip pour spout, IPX6 water protection controls, self-locking marine style safety latch, reinforced rolled rim, center support console, stainless steel construction with 316 series stainless steel liner, 50 PSI
1 ea. 2-year parts & labor warranty, standard

1 ea. 10-Year Hemispheric Bottom Warranty
1 ea. Performance start-up
1 ea. Standard wattage
1 ea. 208v/60/3-ph, 19.6kW, 54.5 amps, standard
1 ea. Model MS12 Measuring Strip, 12 gallons.
2 ea. Model LCHE-12 Kettle Lift-Off Cover Holder, for 12-gallon kettles, per each kettle
2 ea. Model CL12 Lift-Off Cover, 12 gallons, per each kettle
1 ea. Model FS12 Food Strainer, 12 gallons, for direct steam & electric series kettles, stainless steel
1 ea. Model DPK27 Double Pantry Faucet and Bracket Kit
1 ea. Model ST55T Equipment Stand, open base with sliding drain drawer & splash screen, 55" x 20", 18" high, stainless-steel top and legs, allows unit to be hard piped to a floor drain.
1 ea. Model SG28 (2) Retractable splash guard/pan shelves, for drain drawer, for ST55 (requires (2) SG28 drawers)

GROEN and SOUTHBEND will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 27 -RANGE, 24", 4 FRENCH HOT PLATES (1 REQ'D)
Vulcan
Model EV24S-4FP208
Restaurant Range, electric, 24", (4) 2.0 kW French hotplates, 9-1/2" solid cast iron, infinite controls, standard oven, (1) rack, stainless steel front, sides, single-deck high shelf & 6" legs, 208v
1 ea. 1-year limited parts & labor warranty, standard
1 ea. 208v/50-60/3-ph, 13.0kW, 37.5 amps, direct wire, standard
1 ea. Single deck stainless steel high shelf, standard

GARLAND and SOUTHBEND will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 28 - FOOD PROCESSOR, BENCHTOP / COUNTERTOP (1 REQ'D)
Hobart
Model FP150-1B
Food Processor, angled continuous feed design, full-size hopper, 14 lb per/min production cap., 420 rpm, stainless steel cutting surfaces, planetary gear transmission, triple safety interlocks, aluminum housing, rubber feet, 15PLTSS-6PACK, 120/60/1, 1/2 HP, 4.8 amps, UL, NSF

GLOBE and ROBOT COUPE will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 29 - WORKTABLE STAINNLESS STEEL (4 REQ'D)
LTI INC
Refer to drawings, Top - 14 ga. Stainless Steel, Backsplash Up 6" High, Sound Deadening Spray On & Paint, Backsplash "Z" Clips, Backsplash Corner Turn, Rolled Edge Corner Turn, Rolled Edge, Galv, Underbracing, 1-5/8 Inch Stainless Steel Leg and Gusset on Galv. Channel, Adjustable S/S Bullet Feet, 18 Gauge Fixed Undershelf, (2) - 20 x 20 Utility Drawer With S/S Liner, Drawer Locks

All custom fabrication shall be the same manufacturer.

Missouri Equipment Company, Commercial Stainless and IMC Teddy, will be accepted as an equal manufacturer provided the provided the product conforms to the dimensions, construction, design,

capacity, and function of the basis of design.

ITEM 30 - DISPOSER (1 REQ'D)
InSinkErator
Model SS-200-5-CC101
SS-200™ Complete Disposer Package, sink mount system, with #5 adaptor for 3.5" to 4" sink opening, 2 HP motor, stainless steel construction, includes syphon breaker, solenoid valve, flow control valve, programmable CC-101 control center, auto reversing, timed run, post flush, adjustable leg kit

1 ea.	(1) year parts & labor warranty from date of installation (standard)
1 ea.	Standard height disposer body
1 ea.	208v/60/3-ph, 3.6 amps
1 ea.	Model SYPHON STD Syphon breaker standard, 1/2" (11477)

SALVAJOR and MASTER DISPOSER will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 31 -SINK, (2) TWO COMPARTMENT (1 REQ'D)
LTI INC
Model: Custom
Refer to Drawings for sizes, Top - 14 ga. Stainless Steel, Pitched Marine Edge, Backsplash, Sound Deadening Spray On & Paint, Pitched Marine Corner Turn, Galv. Underbracing,1-5/8 Inch Stainless Steel Leg and Gusset on Galv. Channel, Adjustable S/S Bullet Feet, 18 Gauge Fixed Undershelf, (2) - 20 x 20 Utility Drawer With S/S Liner, Drawer Locks, 20" x 20" x 7" Deep Integrally Welded Sink, 20" x 20" x 12" Deep Integrally Welded Sink, Lever waste With Overflow, , 14GA. S/S Control Bracket, 10" Shelf 16 gauge On Table Mounted Brackets, T&S Brass Model B-0133-01 Pre-Rinse Unit

All custom fabrication shall be the same manufacturer.

Missouri Equipment Company, Commercial Stainless and IMC Teddy, will be accepted as an equal manufacturer provided the provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 32 - MIXER, VERTICAL CUTTER VCM (1 REQ'D)
Hobart Model HCM450+BUILDUP Dimensions: 62.5(h) x 36.13(w) x 21.5(d)
Hobart Cutter Mixer with 45 qt capacity stainless steel bowl, a 5 hp motor, see-through high impact plastic lid, removable mixing baffle arm includes built in scraper, tilts 90° for product removal, three modes of operation; jog, run, or timed (5 minute adjustable timer), electric interlocks prevent operation when the lid is unlatched or the bowl is tilted, strainer basket included, two agitators included, cut-mix blade has two stainless steel cutting blades for cutting & chopping, knead-mix attachment has two plastic blades & pulls, stretches, & mixes products, includes 6' power cord, UL, NSF

1 ea	Standard warranty: 1-Year parts and labor
1 ea	Model HCM450-61 200/60/3 Cutter Mixer; includes Cut-Mix attachment, Knead-Mix attachment, Strainer Basket, & Mixing Baffle arm

GLOBE and DOYON will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design

ITEM 33 - FLOOR TROUGH (1 REQ'D)
IMC/Teddy
Model FT-1224-SGAS

FT Floor Trough, 24"W x 12"D, 4" deep receptacle, (1) 6-1/2" waste outlet with perforated waste basket & 4" OD tailpiece, includes anchor straps, 14/304 stainless steel construction, brushed satin finish, (SGAS) anti-slip subway grating, NSF, Made in USA

CUSTOM FABRICATORS will be accepted as an equal manufacturer provided the provided the product conforms to the dimensions, construction, design, capacity and function of the basis of design.

ITEM 34 -SINK, (1) ONE COMPARTMENT (1 REQ'D)
LTI INC
Model: Custom
Refer to Drawings for sizes, Top - 14 ga. Stainless Steel, Pitched Marine Edge, Backsplash, Sound Deadening Spray On & Paint, Pitched Marine Corner Turn, Galv. Underbracing,1-5/8 Inch Stainless Steel Leg and Gusset on Galv. Channel, Adjustable S/S Bullet Feet, 18 Gauge Fixed Undershelf, (1) - 20 x 20 Utility Drawer With S/S Liner, Drawer Locks, 20" x 20" x 12" Deep Integrally Welded Sink, Lever waste With Overflow, 10" Shelf 16 gauge On Table Mounted Brackets, 8” o.c. Faucet hole provisions

All custom fabrication shall be the same manufacturer.

Missouri Equipment Company, Commercial Stainless and IMC Teddy, will be accepted as an equal manufacturer provided the provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 35 -FAUCET, WITH SPRAY HOSE (1 REQ'D)
T**&S Brass**
Model B-0175
Spray Assembly, wall mount mixing faucet with 8" adjustable centers, EasyInstall add-on faucet, 12" swing nozzle with stream regulator outlet (062X), quarter-turn Eterna cartridges with spring checks, lever handles with color coded indexes, 90° swivel adapter arm, 104" flexible stainless-steel hose with heat-resistant gray handle & hold down ring, 1.15 GPM angled spray valve (B-0107-035), wall hook, polished chrome-plated brass faucet body, 1/2" NPT female inlets, CSA
1 kt Model B-0230-K Installation Kit, (2) 1/2" NPT nipples, lock nuts & washers, (2) short "Ell" 1/2" NPT female x male

FISHER and KROWNE will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 36 -BUN / SHEET PAN RACK (4 REQ'D)
Cambro
Model UPR1826FP20580
Ultimate Sheet Pan Rack, 25-7/16"W x 33-3/8"L x 72-3/8"H, full size unit, 3" rail spacing, molded positioning ribs, (20) full-size Camtray® (1826) or (40) half-size Camtray® (1318) capacity, temperature range -36°F (-38°C) to 190°F (88°C), 55 lbs. per shelf/350 lbs. per rack, (4) 5" total locking non-marking thermoplastic rubber swivel casters, composite plastic, brushed graphite
2 ea. 1 yr. standard warranty
2 ea Lifetime warranty against rust and corrosion

NEWAGE AND CRESCOR will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 37 - SPARE NO.

ITEM 38 -FOOD SLICER, ELECTRIC (1 REQ'D)
Hobart Model HS7-1 Dimensions: 27.25(h) x 24.63(w) x 30.31(d)
Heavy Duty Meat Slicer, automatic, 13" CleanCut™ removable knife with removal tool, burnished finish, (3) stroke lengths, & (4) stroke speeds, removable meat grip assembly, removable ring guard cover, single action top mounted sharpener with Borazon™ stones, manual lift lever, 1/2 hp motor, 5.6amps, 120v/60hz/1-ph, NSF cETLus

1 ea	Standard warranty - 1-Year parts, labor & travel time during normal working hours within the USA
1 ea	Model HS-CHUTE Food chute for HS series slicers

GLOBE and BIZERBA will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 39 - PLASTIC SHELVING UNIT (1 LOT REQ'D)
Cambro
Model ESU24XX72V4580
Camshelving® Elements Stationary Starter Unit, 24"W x L x 72"H, 4-tier, withstands temperature from -36°F (-38°C) to 190°F (88°C), includes: (4) vented reinforced polypropylene shelf plates with Camguard® antimicrobial protection, (4) composite posts with leveling feet installed, pre-assembled post connectors & wedges, (8) stationary traverses & (4) bags of 8 count dovetails (16 each A & B), 800 lbs. capacity per shelf /2,000 lbs. max capacity, brushed graphite, NSF

All shelving to be by same manufacture.

METRO and QUANTUM will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design

ITEM 40 -DUNNAGE RACK (1 LOT REQ'D)
Cambro Model DRSXXX480
S-Series Dunnage Rack, slotted top, 3000 lb. load capacity, 21"D x W x 12"H, polypropylene, one-piece, seamless double wall construction, includes (1) Camlink®, 4" square legs, speckled gray, NSF

All shelving to be by same manufacture.

METRO and QUANTUM will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 41 -DRY STORAGE SHELVING (1 LOT REQ'D)
Cambro
Model ESU24XX72S4580
Camshelving® Elements Stationary Starter Unit, 24"W x "L x 72"H, 4-tier, withstands temperature from -36°F (-38°C) to 190°F (88°C), includes: (4) solid reinforced polypropylene shelf plates with Camguard® antimicrobial protection, (4) composite posts with leveling feet installed, pre-assembled post connectors & wedges, (8) stationary traverses & (4) bags of 8 count dovetails (16 each A & B), 800 lbs. capacity per shelf /2,000 lbs. max capacity, brushed graphite, NSF

1 ea	Model EDS24H6580 Camshelving® Elements Dunnage Support, 24"W x 6-1/2"H, recommended for units 54" or longer with weight loads over 600 lbs., brushed graphite, NSF listed components.

All shelving to be by same manufacture.

METRO and QUANTUM will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity, and function of the basis of design.

ITEM 42 – WALK IN COOLER/FREEZER (1 REQ'D)
Make: Louisville Cooler Manufacturing
Model: Custom
See drawings for sizes (1) Cooler/Freezer – floored combination approx. 22'- x 17'
Cooler wall panels shall be 4" thick foamed in place urethane insulation.
Freezer wall panels shall be 5" thick foamed in place urethane insulation.
Ceiling panels shall be 5" thick.
Interior walls and ceilings shall be 24ga Embossed white Galvalume, Unexposed front exterior shall be Embossed white Galvalume, both compartments shall have an integral treadplate floor, (2) 36" x 80" hinged walk-in doors, Doors equipped with three self-closing hinges, latch and door closer. Exterior door fronts and interior door pans shall be equipped with 34" high aluminum tread plate Kick-plates. Doors equipped with Chrome latch and safety inside releases. Two digital thermometers. (2) 14"x14" view windows in doors-Heated for Freeze, (1) Pressure relief ports(heated), (2) Bi-parting swing vinyl strip curtains, 48" Led Lights, 2" vinyl bumper guards with end caps spanning full length of exposed front, removable closer trim seals building
White Embossed Steel flashing and trim for exposed Exterior,
Refrigeration as follows:
Freezer:
Electric Defrost with QRC controls Freezer coil. (with EC motors) and Scroll Climate Control condensing units 448A refrigerant
Units complete with Liquid line Solenoid valves, Liquid line filters, Driers, and Reverse Acting Pressure Controls. Fused disconnect is NOT included. Five (5) year warranty on motor compressor.
Cooler:
air defrosts cooler coils with QRC controls (with EC motors) One Scroll Climate Control condensing units.

THERMAL KOOL and BALLY will be accepted as equal manufacturers provided the product conforms to the dimensions, construction, design, capacity and function of the basis of design.

END OF SPECIFICATION

SECTION 123216 – LAMINATE CLAD CASEWORK

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Fixed modular laminate clad casework and components.

B. Countertops.

1.02 RELATED SECTIONS

A. Blocking within walls where indicated: Division 6.

B. Millwork, trim, and custom cabinetry: Division 6.

C. Locks master keyed to room doors: Division 8.

D. Glass: Division 8.

E. Base molding: Division 9.

F. Sinks and service fixtures, service waste lines, connections, and vents: Division 15.

G. Electrical service fixtures: Division 16.

1.03 DEFINITIONS

A. Identification of casework components and related products by surface visibility.

Open Interiors: Any open storage unit without solid door or drawer fronts and units with full glass insert doors and/or acrylic doors.

Closed Interiors: Any closed storage unit behind solid door or drawer fronts, sliding solid doors.

Exposed Ends: Any storage unit exterior side surface that is visible after installation.

Other Exposed Surfaces: Faces of doors and drawers when closed, and tops of cabinets less than 72 inches above furnished floor.

Semi-Exposed Surfaces: Interior surfaces which are visible, bottoms of wall cabinets and tops of cabinets 72 inches or more above finished floor.

6. Concealed Surfaces: Any surface not visible after installation.

1.04 QUALITY ASSURANCE

A. Manufacturer: Minimum of 5 years experience in providing manufactured casework systems for similar types of projects, produce evidence of financial stability, bonding capacity, and adequate facilities and personnel required to perform on this project.

B. Manufacturer: Provide products certified as meeting or exceeding ANSI-A 161.1-1998 testing standards.

1.05 SUBMITTALS

A. Comply with Section 01330, unless otherwise indicated.

B. Product Data: Manufacturer's catalog with specifications and construction details.

C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.

1. Include section drawings of typical and special casework, work surfaces and accessories.
2. Indicate locations of plumbing and electrical service field connection by others.

D. Casework Samples:

1. Base cabinet: Cabinet conforming to specifications, with drawer and door.

2. Wall cabinet: Cabinet conforming to specifications, with door.

3. Cabinet samples shall be complete with specified hardware for doors, drawers and shelves.

4. Component samples: Two sets of samples for each of the following:

a. Decorative laminate color charts.
b. PVC edgings.

1.06 PRODUCT HANDLING

A. Deliver completed laminate clad casework, countertops, and related products only after wet operations in building are completed, store in ventilated place, protected from the weather, with relative humidity range of 20 percent to 50 percent.

B. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.

1.07 JOB CONDITIONS

A. Environmental Requirements: Do not install casework until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least 1 week.

1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.
2. After installation, control temperature and humidity to maintain relative humidity between 25 percent and 55 percent.

B. Conditions: Do not install casework until interior concrete work, masonry, plastering and other wet operations are complete.

1.08 WARRANTY

A. Contractor shall provide ten-year warranty (from date of Substantial Completion) against all defects in material and workmanship.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturer:

1. TMI Systems Design Corporation, Dickinson, North Dakota – Basis of design
2. LSI
3. Russwood
4. Stevens
5. American Visual Display Products, LLC
6. SSC Casework/Millwork
7. Approved equal

2.02 MATERIALS

A. Core Materials:

1. Particleboard up to 7/8 inch thick: Industrial Grade average 47-pound density particleboard, ANSI A 208.1-1999, M-3.
2. Particleboard 1 inch thick and thicker: Industrial Grade average 45-pound density particle-board, ANSI A 208.1-1999, M-2.
3. MR Moisture Resistant Particleboard: Average 47-pound density particleboard, ANSI A 208.1 1-1999, M-3.
4. Medium Density Fiberboard 1/4 inch thick: Average 54-pound density grade, ANSI A 208.2.
5. Medium Density Fiberboard 3/4 inch thick: Average 48-pound density grade, ANSI A 208.2.

B. Decorative Laminates:

1. High-pressure decorative laminate VGS (.028), NEMA Test LD 3-1995.
2. High-pressure decorative laminate HGS (.048), NEMA Test LD 3-1995.
3. High-pressure decorative laminate HGP (.039), NEMA Test LD 3-1995.
4. High-pressure cabinet liner CLS (.020), NEMA Test LD 3-1995.
5. High-pressure backer BKH (.048), (.039), (.028), NEMA Test LD3-1995.
6. Thermally fused melamine laminate, NEMA Test LD 3-1995.

C. Chemical-Resistant decorative laminate, NEMA Test LD 3-1995.

C. Laminate Color Selection: Maximum 1 color per unit face and 5 colors per project. (See Color Selection in section 3.05).

E. Edging Materials:

1. 1mm PVC banding.
2. 3mm PVC banding, machine profiled to 1/8 inch radius.

2.04 CABINET HARDWARE

A. Hinges:

1. Five knuckle, epoxy powder coated, institutional grade, 2-3/4 inch overlay type with hospital tip. 0.095 inch thick. ANSI-BHMA standard A156.9, Grade 1.

a. Doors 48 inches and over in height have 3 hinges per door.
b. Magnetic door catch with maximum 5 pound pull provided, attached with screws and slotted for adjustment.

B. Pulls:

1. Door and drawer front pulls are epoxy powder coated metal wire style, 96mm spacing on screws. Pull design shall comply with the Americans with Disability Act (ADA).

C. Drawer Slides:

1. Regular, kneespace and pencil: 100-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature. Paper storage, 150-pound load rated epoxy coated steel slides.
2. File: Full extension, 150-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature.

D. Adjustable Shelf Supports:

1. Injection molded transparent polycarbonate friction fit into cabinet end panels and vertical dividers, adjustable on 32mm centers. Each shelf support has 2 integral support pins, 5mm diameter, to interface pre-drilled holes, and to prevent accidental rotation of support. The support automatically adapts to 3/4 inch or 1 inch thick shelving and provides non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds (300 pounds per support) without failure.

E. Locks:

1. National #M49054, removable core, disc tumbler, cam style lock with strike. Furnish 2 keys. Lock for sliding 3/4 inch thick doors is a disc type plunger lock, sliding door type with strike. Lock for sliding glass/acrylic doors is a ratchet type sliding showcase lock.

2. Automatic door bolt, Hafele #530-1604, used to secure inactive door on alllocked cabinets.

F. Sliding Door Track: Anodized aluminum double channel.

G. Coat Rods: 1 inch diameter, 14-gauge chrome plated steel installed in captive mounting hardware.

H. File Suspension System: Extruded molding integral with top of drawer box sides to accept standard hanging file folders.

I. Mirrors: 1/4 inch thick polished mirror plate.

2.05 FABRICATION:

A. Fabricate casework, countertops and related products to dimensions, profiles, and details shown.

B. Cabinet Body Construction:

1. Tops and bottoms are glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals. Minimum 6 dowels each joint for 24 inch deep cabinets and a minimum of 4 dowels each joint for 12 inch deep cabinets.

a. Tops, bottoms and sides of all cabinets are particleboard core.

2. Cabinet backs: 1/2 inch thick prefinished medium density fiberboard. Wall and tall cabinets are provided with a 1 inch x 1-3/4 inch PVC mounting strip used to secure the cabinet to the wall.

a. Exposed back on fixed or movable cabinets: 3/4 inch thick particleboard with the exterior surface finished in VGS laminate as selected.

b. Flexible rail mounted cabinet backs: 3/4 inch thick particleboard structurally doweled into cabinet sides and top panels.

3. Fixed base and tall units have an individual factory-applied base, constructed of 3/4 inch thick exterior grade plywood. Base is 96mm (nominal 4 inch) high unless otherwise indicated on the drawings.

4. Base units, except sink base units: Full sub-top. Sink base units are provided with open top, a welded steel/epoxy painted sink rail full width at top front edge concealed behind face rail/doors, a split back removable access panel.

5. Side panels and vertical dividers shall receive adjustable shelf hardware at 32mm line boring centers. Mount door hinges, drawer slides and pull-out shelves in the line boring for consistent alignment.

6. Exposed and semi exposed edges.

a. Edging: 1mm PVC.

7. Adjustable shelf core: 3/4 inch thick particleboard up to 30 inches wide, 1 inch thick particleboard over 30 inches wide.

a. Front edge: 1mm PVC

8. Interior finish, units with open Interiors:

a. Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine laminate with matching prefinished back.

9. Interior finish, units with closed Interiors:

a. Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine laminate with matching prefinished back.

10. Exposed ends:

a. Faced with VGS high-pressure decorative laminate.

11. Wall unit bottom:

a. Faced with thermally fused melamine laminate.

12. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), not permitted.

C. Drawers:

1. Sides, back and sub front: Minimum 1/2 inch thick particleboard, laminated with thermally fused melamine doweled and glued into sides. Top edge banded with 1mm PVC.

2. Drawer bottom: Minimum 1/2 inch thick particleboard laminated with thermally fused melamine, screwed directly to the bottom edges of drawer box.

3. Paper storage drawers: Minimum 3/4 inch thick particleboard sides, back, and sub front laminated with thermally fused melamine. Minimum 1/2 inch thick particleboard drawer bottoms screwed directly to the bottom edges of the drawer box. Provide PVC angle retaining bar at the rear of the drawer.

D. Door/Drawer Fronts:

1. Core: 3/4 inch thick particleboard.

2. Provide double doors in opening in excess of 24 inches wide.

3. Faces:

a. Exterior: VGS High-pressure decorative laminate.

b. Interior: High-pressure cabinet liner CLS.

4. Door/drawer edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.

4. Miscellaneous Shelving:

a. Core material: 3/4 inch or 1 inch thick particleboard.

b. Exterior: VGS High-pressure decorative laminate.

a. Edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.

2.06 DECORATIVE LAMINATE COUNTERTOPS:

A. Core: 1 inch thick ANSI A 208.1-1993 M-2 particle board.

B. Surface: HGS/HGP high-pressure decorative laminate with balanced backer sheeting.

C. Edges, including applied backsplash: 3mm PVC, exposed edges and corners machine profiled to 1/8 inch radius. Edges are machine applied with moisture curing polyurethane (PUR) hotmelt for fast setting, high strength adhesion.

PART 3- EXECUTION

3.01 INSPECTION:

A. The casework contractor must examine the job site and the conditions under which the work under this section is to be performed, and notify the building owner in writing of unsatisfactory conditions. Do not proceed with work under this Section until satisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 PREPARATION:

A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.

3.03 INSTALLATION:

A. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit.

B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind.

C. Repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged cabinets or materials.

3.04 CLEANING:

A. Leave cabinets broom clean inside and out. Wipe off fingerprints, pencil marks, and surface soil etc., in preparation for final cleaning by the building owner.

B. Remove and dispose of all packing materials and related construction debris.

3.05 COLOR SELECTION:

A. Laminate Color Selection:

1. Architect will select from the manufacturer's full range of Wilsonart®, Nevamar®, Pionite®, and Formica® stock color charts for cabinet faces, exposed ends, open interiors, and countertops.

B. Hinge and Pull Color Selection:

1. Architect will select from manufacturer's full range of standard finishes.

C. Miscellaneous Hardware Color Selection (support brackets, table frames, rail):

1. Architect will select from the manufacturer's full range of standard colors.

D. 1mm PVC Edge Banding Color Selection:

1. Architect will select from the manufacturer’s full range of standard 1mm PVC edging colors.

E. 3mm PVC Edge Banding Color Selection:

1. Architect will select from the manufacturer’s full range of standard 3mm PVC colors.

END OF SECTION 123216

PROJECT MANUAL

VOLUME #3

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
Munfordville, Kentucky

SCB 2210 / BG# 23-277
JULY 2023

OWNER
Hart County Board of Education
Munfordville, Kentucky

SUPERINTENDENT – Nathan Smith

ARCHITECTS, CIVIL & STRUCTURAL ENGINEERS:
SHERMAN CARTER BARNHART ARCHITECTS, PLLC
144 TURNER COMMONS WAY, SUITE 110
LEXINGTON, KENTUCKY 40509
859-224-1351

MECHANICAL / ELECTRICAL / PLUMBING:
CMTA
10411 MEETING STREET
PROSPECT, KENTUCKY 40059
502-326-3085

STRUCTURAL ENGINEER:
POAGE ENGINEERS AND ASSOCIATES
880 SPARTA COURT, SUITE 200
LEXINGTON, KY 40504
859-255-9034

INDEX

DIVISION 20 - MECHANICAL

DIVISION 21 – Fire Protection

DIVISION 22 – Plumbing

DIVISION 23 – HVAC

DIVISION 25 – Building Automation System

INDEX

321313	Cement Concrete Pavement
321373	Concrete Pavement Joint Sealants
321723	Painted Pavement Markings
323113	Chain-Link Fences and Gates
330513	Manholes and Structures
334100	Storm Drainage
334111	Site Storm Utility Drainage Piping
334600	Subdrainage

SECTION 200100 – GENERAL PROVISIONS - MECHANICAL

PART 1 – GENERAL:

1.1 The Advertisement for Bid, Instructions to Bidders, Bidding Requirements, General, Special and Supplementary Conditions, and all other Contract Documents shall apply to the Contractor's work as well as to each of their Sub-Contractor's work.

1.2 All manufacturers, suppliers, fabricators, contractors, etc. submitting proposals for any part of the work, services, materials, or equipment to be used on or applied to this project are hereby directed to familiarize themselves with the Contract Documents. In case of conflict between these General Provisions and the General and/or Special Conditions, the Contractor shall contact the Engineer for clarification and final determination prior to the Bid.

1.3 The work included in this Division consists of the furnishing of all labor, equipment, transportation, excavation, backfill, supplies, material, appurtenances, and services necessary for the satisfactory installation of the complete and operating Mechanical Systems indicated or specified in the Contract Documents.

1.4 Any materials, labor, equipment, or services not mentioned specifically herein which may be necessary to complete any part of the Mechanical Systems in a substantial manner, in compliance with the requirements stated, implied, or intended in the Plans and/or Specifications, shall be included in the Bid as part of this Contract.

1.5 It is not the intent of this Section of the Specifications to make any Contractor, other than the General Contractor or Construction Manager responsible to the Owner. All transactions such as submittal of shop drawings, claims for extra costs, requests for equipment or materials substitution, shall be routed through the General Contractor to the Architect, then to the Engineer. Also, this Section of the Specifications shall not be construed as an attempt to arbitrarily assign responsibility of work, material, equipment or services to a particular trade or Contractor. Unless stated otherwise, the subdivision and assignment of work under the various sections shall be optional.

1.6 The Architect and Engineer do not define the scope of individual trades, subcontractors, material suppliers and vendors. Any sheet numbering system or specification numbering system used which identifies disciplines is solely for the Architect and Engineer’s convenience and is not intended to define a subcontractor’s scope of work. Information regarding individual trades, subcontractors, material suppliers and vendors may be detailed, described, and indicated at different locations throughout the Contract Documents. No consideration will be given to requests for change orders for failure to obtain and review the complete set of Contract Documents when preparing Bids, prices, and quotations. Unless stated otherwise, the subdivision and assignment of work under the various sections shall be the responsibility of the Contractor holding the prime contract.

1.7 It is the intent of the Contract Documents to deliver to the Owner a new, complete, and operational project once the work is complete. Although Plans and Specifications are complete to the extent possible, it shall be the responsibility of the Contractors involved to remove and/or relocate or re-attach any existing or new systems which interfere with new equipment or materials required for the complete installation without additional cost to the Owner.

1.8 In general, all work shall be accomplished without interruption of existing facilities operations. The Contractor shall advise the Owner at least seven (7) days prior to the interruption of any services (gas, domestic water, heating, etc.). The Owner shall be advised of the exact time that interruption will occur and the length of time the interruption will last. Failure to comply with this requirement may result in complete work stoppage for the Contractors involved until a complete schedule of interruptions can be developed.

1.9 Whenever utilities are interrupted, either deliberately or accidentally, the Contractor shall work continuously to restore said service. The Contractor shall provide tools, materials, skilled journeymen of Bidder/Proposer's own and other trades as necessary, premium time as needed and coordination with all applicable utilities, including payment of utility company charges (if any), all without requests for extra compensation from the Owner.

1.10 Each Bidder/Proposer shall also be governed by any unit prices and Addenda insofar as they may affect part of their work or services.

1.11 DEFINITIONS AND ABBREVIATIONS:

- Contractor - Any Contractor whether bidding, proposing, or working independently or under the supervision of a General Contractor, Prime Contractor, Construction Manager and who installs any type of Mechanical Work as specified in the Contract Documents or, the General Contractor.
- Engineer - The Consulting Mechanical-Electrical Engineer either consulting to the Owner, Architect, or Other, etc. In this case: CMTA, Inc., Consulting Engineers.
- Architect - The Architect of Record for the project.
- Contract Documents - All documents pertinent to the quality and quantity of work to be performed on this project. Includes, but not limited to: Plans, Specifications, Instructions to Bidders, General and Special Conditions, Addenda, Alternates, Lists of Materials, Lists of Sub-Contractors, Unit Prices, Shop Drawings, Field Orders, Change Orders, Cost Breakdowns, Schedules of Value, Periodical Payment Requests, Construction Contract with Owner, etc.
- Bidder/Proposer - Any person, agency or entity submitting a proposal to any person, agency or entity for any part of the work required under this contract.
- The Project - All of the work required under this Contract.
- Furnish - Deliver to the site in good condition and turn over to the Contractor who is to install.
- Provide - Furnish and install complete, tested, and ready for operation.
- Install - Receive and place in satisfactory operation.
- Indicated - Listed in the Specifications, shown on the Plans or Addenda thereto.
- Typical or Typ.- Where indicated repeat this work, method or means each time the same or similar condition occurs whether indicated or not.
- ADA - Americans with Disabilities Act.
- AGA - American Gas Association.
- ANSI - American National Standards Institute.
- ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers.
- ASME - American Society of Mechanical Engineers.
- IBC - International Building Code.
- NEC - National Electrical Code.
- NEMA - National Electrical Manufacturers Association.
- NFPA - National Fire Protection Association.
- OSHA - Office of Safety and Health Administration.
- SMACNA - Sheet Metal and Air Conditioning Contractors National Association.
- UL - Underwriters Laboratories.

PART 2 – INTENT AND INTERPRETATION:

2.1 It is the intention of the Contract Documents to call for a complete and operational system, including all components, accessories, finish work, etc as necessary for trouble free operation, tested and ready for operation. Anything that may be required, implied, or inferred by the Contract Documents shall be provided and included as part of the Bid.

2.2 All Contractors and Vendors providing a bid for this project shall review the Plans and Specifications and determine any modifications and/or adjustments necessary relative to the

proposed equipment and materials with specific manufacturer's installation requirements. Include in the bid any necessary installation methods, features, options, accessories, etc. necessary to install the proposed equipment and materials, regardless of whether used as basis of design or being offered as a substitution in accordance with the specific manufacturer's installation requirements whether specifically detailed or not within the Plans and Specifications.

2.3 Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.

2.4 The Bidder/Proposer shall completely review the Contract Documents. Any interpretation as to design intent or scope shall be provided by the Engineer / Architect. Should an interpretation be required, the Bidder/Proposer shall request a clarification not less than ten (10) days prior to the submission of the proposal so that the condition may be clarified by Addendum. In the event of any conflict, discrepancy, or inconsistency develops; the interpretation of the Engineer shall be final.

2.5 The Contractor shall give written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction; and any necessary items of work omitted a minimum of ten (10) days prior to bid. In the absence of such written notice and by the act of submitting a bid, it shall be understood that the Contractor has included the cost of all required items in the bid, and that will be responsible for the approved satisfactory functioning of the entire system without extra compensations.

PART 3 – INDEMNIFICATION:

3.1 The Contractor shall hold harmless and indemnify the Engineer, employees, officers, agents and consultants from all claims, loss, damage, actions, causes of actions, expense and/or liability resulting from, brought for, or on account of any personal injury or property damage received or sustained by any person, persons, (including third parties), or any property growing out of, occurring, or attributable to any work performed under or related to this contract, resulting in whole or in part from the negligence of the Contractor, any subcontractor, any employee, agent or representative.

PART 4 – PLANS AND SPECIFICATIONS:

4.1 The Plans are diagrammatic only and indicate the general arrangement of the systems and are to be followed. If deviations from the layouts are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Engineer for approval before proceeding with the work. The Plans are not intended to show every item which may be necessary to complete the systems. All Bidder/Proposers shall anticipate that additional items may be required and submit their Bid accordingly.

4.2 The Plans and Specifications are intended to supplement each other. No Bidder/Proposer shall take advantage of conflict between them, or between parts of either. Should this condition exist, the Bidder/Proposer shall request a clarification not less than ten (10) days prior to the submission of the proposal so that the condition may be clarified by Addendum. In the event that such a condition arises after work is started, the interpretation of the Engineer shall be final.

4.3 The Plans and Specifications shall be cooperative and anything appearing in the Specifications which may not be indicated on the Plans or conversely, shall be considered as part of the Contract and must be executed the same as though indicated by both.

4.4 Contractor shall make all their own measurements in the field and shall be responsible for correct fitting. The work shall be coordinated with all other branches of work in such a manner as to cause a minimum of conflict or delay.

4.5 The Engineer shall reserve the right to make adjustments in location of piping, ductwork, equipment, etc. where such adjustments are in the interest of improving the project.

4.6 Should conflict, overlap or duplication of work between the various trades become evident, this shall be called to the attention of the Engineer. In such event neither trade shall assume to be relieved of the work which is specified under their branch until instructions in writing are received from the Engineer.

4.7 Unless dimensioned, the Plans only indicate approximate locations of equipment, piping, ductwork, etc. Dimensions given in figures on the Plans shall take precedence over scaled dimensions and all dimensions, whether given in figures or scaled, shall be verified in the field to ensure no conflict with other work.

4.8 Each Bidder/Proposer shall review all Plans in the Contract Documents to ensure that the work they intend to provide does not create a conflict with or affect the work of others in any way. Where such effect does occur, it shall be the Bidder/Proposer's responsibility to satisfactorily eliminate any such conflict or effect prior to the submission of their proposal. Each Bidder/Proposer shall ensure that there is adequate space to install their equipment and materials. Failure to do so shall result in the correction of such encroachment conflict or effect of any work awarded the Bidder/Proposer and shall be accomplished fully without expense to others and that they are reasonably accessible for maintenance. Check closely all mechanical and electrical closets, chases, ceiling voids, wall voids, crawl spaces, etc., to ensure adequate spaces.

4.9 Where on the Plans a portion of the work is drawn out and the remainder is indicated in outline, or not indicated at all, the parts drawn out shall apply to all other like portions of the work. Where ornamentation or other detail is indicated by starting only, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to all other similar parts of the work, unless otherwise indicated.

4.10 Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.

4.11 Where within the Contract Documents the word “typical” or “typ.” is used, it shall mean that the work method or means indicated as typical shall be repeated in and each time it occurs whether indicated or not.

4.12 Each Contractor shall evaluate ceiling heights specified on Architectural Plans. Where the location of equipment or systems may interfere with ceiling heights or maintenance and access of equipment or systems, the Contractor shall call this to the attention of the Engineer in writing prior to making the installation. Do not install equipment or systems in the affected area until the conflict is resolved. Any such changes shall be anticipated and requested sufficiently in advance to not cause extra work or cost incurred on the part of the Contractor or unduly delay the work.

PART 5 – EXAMINATION OF SITE AND CONDITIONS:

5.1 Each Bidder/Proposer shall inform themselves of all the conditions under which the work is to be performed, the site of the work, the structure of the ground, above and below grade, the obstacles that may be encountered, the availability and location of necessary facilities and all relevant matters concerning the work.

5.2 Each Bidder/Proposer shall also fully acquaint themselves with all existing conditions as to ingress and egress, distance of haul from supply points, routes for transportation of materials, facilities and services, availability of utilities, etc. A proposal shall cover all expenses or

disbursements in connection with such matters and conditions. No allowance will be made for lack of knowledge concerning such conditions after Bids are accepted.

PART 6 – EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS:

6.1 When any Contractor requests approval of materials and/or equipment of different physical size, weight, capacity, function, color, access, then the design allows for it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, etc. from that indicated, electrical service, etc. In all cases where substitutions affect other trades, the Contractor requesting such substitutions shall advise all such Contractors of the change and shall compensate them for all necessary changes in their work. Any Plans, Specifications, Diagrams, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense. Review of Shop Drawings by the Engineer does not in any way absolve the Contractor of this responsibility.

6.2 Notwithstanding any reference in the Specifications to any article, device, product, material, fixture, form, or type of construction by name, make or catalog number, such reference shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; any devices, products, materials, fixtures, forms, or types of construction which, in the judgment of the Engineer, are equivalent to those specified are acceptable, provided the provisions of this Part are met. Requested substitutions shall be submitted to the Engineer a minimum of ten (10) days prior to Bid. If this procedure is not followed, the substitution will be rejected. If prevailing laws of cities, towns, states, or countries are more stringent than these specifications regarding such substitutions, then those laws shall prevail over these requirements.

6.3 Wherever any equipment and material are specified exclusively only such items shall be used unless substitution is accepted in writing by the Engineer.

6.4 Each Bidder/Proposer shall furnish along with their proposal a list of specified equipment and materials which is to be provided. Where several makes are mentioned in the Specifications and the Contractor fails to state which, they propose to furnish, the Engineer shall choose any of the makes mentioned without change in price. Inclusion in this list shall not ensure that the Engineer will approve shop drawings unless the equipment, materials, etc., submitted in shop drawings are satisfactorily comparable to the items specified and/or indicated.

6.5 Coordinate kitchen equipment selection by the General Contractor prior to Bid. Any deviations and/or conflicts for any kitchen equipment shall be the Contractor’s responsibility.

PART 7 – CODES, RULES, PERMITS, FEES, INSPECTIONS, REGULATIONS, ETC.:

7.1 The Contractor shall give all necessary notices, obtain, and pay for all permits, government sales taxes, fees, inspections, and other costs, including all utility connections, meters, meter settings, taps, tap fees, extensions, etc. in connection with their work. They shall also file all necessary plans, prepare all documents, and obtain all necessary approvals of all governmental departments and/or the appropriate municipality or utility company having jurisdiction, whether indicated or specified or not. They shall also obtain all required certificates of inspection for their work and deliver same to the Engineer before request for acceptance and final payment for the work.

7.2 Ignorance of Codes, Rules, regulations, utility company requirements, laws, etc., shall not diminish or absolve Contractor's responsibilities to provide and complete all work in compliance with such.

7.3 The Contractor shall include in their work, without extra cost, any labor, materials, services, apparatus, and Plans in order to comply with all applicable laws, ordinances, rules and regulations, whether or not indicated or specified.

7.4 All materials furnished and all work installed shall comply with the National Fire Codes of the National Fire Protection Association, with the requirements of local utility companies, or municipalities and with the requirements of all governmental agencies having jurisdiction.

7.5 All materials and equipment so indicated and all equipment and materials for the electrical portion of the mechanical systems shall bear the approval label of or shall be listed by the Underwriters' Laboratories (UL), Incorporated. Each packaged assembly shall be approved as a package. Approval of components of a package shall not be acceptable.

7.6 All plumbing work is to be constructed and installed in accordance with applicable codes, Plans and Specifications which have been approved in their entirety and/or reflect any changes requested by the Authority Having Jurisdiction. Plumbing work shall not commence until such Plans are in the possession of the Plumbing Contractor.

7.7 All Heating, Ventilation and Air Conditioning work shall be accomplished in accordance with the Building Code and amendments thereto, the latest standards recognized by the American Society of Heating, Refrigerating and Air Conditioning and the National Fire Protection Association.

7.8 The Contractor shall furnish three (3) copies of all Final Inspection Certificates obtained to the Engineer when work is complete. Final payment for work will be contingent upon compliance with this requirement.

7.9 Where minimum code requirements are exceeded in the Design, the Design shall govern.

7.10 The Contractor shall ensure that their work is accomplished in accord with the OSHA Standards and that they conduct their work and the work of their personnel in accord with same.

7.11 All work relating to the handicapped shall be in accord with regulations currently enforced by the Authority Having Jurisdiction and the American Disabilities Act.

7.12 All work in conjunction with a natural gas installation shall, in addition to all other Codes, Rules, Regulations, Standards, etc., comply with the requirements of the local gas supplier and/or standards and recommendations of the American Gas Association.

7.13 All work in relation to domestic water systems shall, in addition to all other Codes, Rules, Regulations and Standards, be in compliance with the requirements of the local water utility company.

7.14 All work in relation to the installation of sanitary or storm sewers shall, in addition to all other Codes, Rules, Regulations and Standards, be in compliance with the local agency governing such installations.

7.15 Discharge of any toxic, odorous, or otherwise noxious materials into the atmosphere or any system shall be subject to regulations of the Environmental Protection Agency (EPA) and/or the air pollution control commission. If in doubt, contact the State Department for Environmental Protection.

7.16 Where conflict arises between any code and the Plans and/or Specifications, the code shall apply except in the instance where the Plans and Specifications exceed the requirements of the code. Any changes required as a result of these conflicts shall be brought to the attention of the

Engineer at least ten (10) days prior to bid date, otherwise the Contractor shall make the required changes at their own expense.

PART 8 – QUALIFICATIONS OF CONTRACTOR/WORKERS:

8.1 All Mechanical Contractors and their subcontractors bidding this project must have been a licensed company for a minimum of three (3) years to qualify to Bid this project. Individual employee experience does not supersede this requirement.

8.2 All mechanical subcontractors bidding the mechanical work must have completed one project of 70% this subcontract cost size and two projects of 50% this subcontract cost size.

8.3 All mechanical work shall be accomplished by qualified workers competent in the area of work for which they are responsible. Untrained and incompetent workers, as evidenced by their workmanship, shall be summarily relieved of their responsibilities in areas of incompetency. The Engineer shall reserve the right to determine the quality of workmanship of any workers and unqualified or incompetent workers shall refrain from work in areas not deemed satisfactory. Requests for relief of workers shall be made through the normal channels of Architect, Contractor, etc.

8.4 The Contractor shall hold all required licenses in the State which the work is to be performed.

8.5 All plumbing work shall be accomplished by Journeymen Plumbers under the direct supervision of a Master Plumber as defined under State Plumbing Law Regulations and Code. Proof and Certification may be requested by the Engineer.

8.6 The installation of all Heating, Ventilating and Air-Conditioning Systems (HVAC) by any Contractor, whether in existing or new building construction shall be performed by a Licensed Master HVAC Contractor. This includes any Contractor installing HVAC systems, piping, and ductwork.

8.7 All sheet metal, insulation and pipe fitting work shall be installed by workers normally engaged in this type work.

8.8 All automatic control systems shall be installed by workers normally engaged or employed in this type work, except in the case of minor control requirements (residential type furnaces, packaged HVAC equipment with integral controls, etc.) in which case, if a competent worker is the employee of this Contractor, the worker may be utilized subject to review of their qualifications by the Engineer and after written approval from same.

8.9 All special systems (Medical Gases, Automatic Sprinkler Equipment, etc.) shall be installed only by workers normally engaged in such services. Exception to this specification may only be made in writing by the Engineer.

8.10 All electrical work shall be accomplished by Licensed Journeymen electricians under the direct supervision of a licensed Electrician. All applicable codes, utility company regulations, laws and permitting authority of the locality shall be fully complied with by the Contractor.

PART 9 – SUPERVISION OF WORK:

9.1 The Contractor shall personally supervise the work for which they are responsible or have a competent superintendent, approved by the Engineer, on the work at all times during progress with full authority to act on behalf of the Contractor.

PART 10 – CONDUCT OF WORKERS:

10.1 The Contractor shall be responsible for the conduct of all workers under their supervision. Misconduct on the part of any worker to the extent of creating a safety hazard, or endangering the lives and property of others, shall result in the prompt removal of that worker. The consumption of alcoholic beverages or other intoxicants, narcotics, barbiturates, hallucinogens, or rehabilitating drugs on the job site is strictly forbidden.

PART 11 – COOPERATION AND COORDINATION WITH OTHER TRADES:

11.1 The Contractor shall give full cooperation to all other trades and shall furnish in writing with copies to the Engineer, any information necessary to permit the work of other trades to be installed satisfactorily and with the least possible interference or delay.

11.2 Where any work is to be installed in close proximity to, or will interfere with work of other trades, each shall cooperate in working out space conditions to make a satisfactory adjustment. If so, directed by the Engineer, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than ¼" = 1'-0", clearly indicating how their work is to be installed in relation to the work of other trades, or so as not to cause any interference with work of other trades. Make the necessary changes in the work to correct the condition without extra charge.

11.3 The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

PART 12 – GUARANTEES AND WARRANTIES:

12.1 The Contractor shall guarantee all equipment, apparatus, materials, and workmanship entering into their Contract to the best of its respective kind and shall replace all parts at their own expense, which are proven defective within the time frame outlined in the General Conditions of the Contract. The effective date of completion of the work shall be the date of the Project's Statement of Substantial Completion. Items of equipment which have longer guarantees, as called for in these Specifications, shall have warranties and guarantees completed in order, and shall be in effect at the time of final acceptance of the work by the Engineer. The Contractor shall present the Engineer with such warranties and guarantees at the time of final acceptance of the work. The Engineer shall then submit these warranties, etc. to the Owner. The Owner reserves the right to use equipment installed by the Contractor prior to date of final acceptance. Such use of equipment shall not invalidate the guarantee except that the Owner shall be liable for any damage to equipment during this period, due to negligence of their operator or other employees. Refer to other sections for any special or extra warranty requirements.

12.2 All gas fired heat exchangers shall have 15 year warranty.

12.3 All compressors shall have five year warranty. (1st year parts and labor, 2nd thru 5th year compressor parts only).

12.4 All VFD's shall have a two year warranty. (Parts and Labor).

12.5 Provide all warranty certificates to Owner. All warranties begin starting at the substantial completion date, submit warranty certificates accordingly.

PART 13 – COST BREAKDOWNS (SCHEDULE OF VALUES):

13.1 Within thirty (30) days after acceptance of the Contract, the Contractor shall furnish to the Engineer, one copy of a detailed cost breakdown on each respective area of work. These cost

breakdowns shall be made in a format approved by the Engineer. Payments will not be made until satisfactory cost breakdowns are submitted.

13.2 The breakdown shall be minimally as follows. Material and labor shall be listed separately. Pay special attention to required withholding percentages for startup, testing, documentation, acceptance, owner training, etc.:

- Mechanical Shop Drawings
- Mechanical Record Drawings & Acceptance
- Mechanical O&M Manuals & Acceptance
- Mechanical Owner Training & Acceptance
- Spare Parts
- Coordination Drawings
- Mechanical Identification Materials & Labor
- HVAC Piping Materials & Labor
- HVAC Piping Testing, Cleaning, Documentation, Acceptance, etc.
- HVAC Piping Purging, Flushing, Cleaning
- Insulation (Piping) Materials & Labor
- Insulation (Ductwork) Materials & Labor
- Plumbing Fixtures and Equipment
- Underground Sanitary Piping Materials & Labor
- Above Ground Sanitary & Vent Piping Materials & Labor
- Domestic Water Piping Materials & Labor
- Storm Piping
- Plumbing Shop Fabrication
- Domestic Water Heater Equipment & Labor
- Domestic Water Heater Startup, Testing, Documentation, Training, Acceptance, etc.
- Fire Protection Shop Drawings
- Fire Protection Materials & Labor
- Fire Protection Record Drawings & Acceptance
- Sheetmetal Equipment
- Sheetmetal Materials & Labor
- Sheetmetal Shop Fabrication
- Ductwork Air Leakage Testing, Documentation, Acceptance, etc.
- Filters and Racks Materials & Labor
- Heat Pump Equipment & Labor
- Heat Pump Startup, Testing, Documentation, Training, Acceptance, etc.
- Water to Water Heat Pump Equipment & Labor
- Water to Water Heat Pump Startup, Testing, Documentation, Training, Acceptance, etc.
- Air Handling Unit Equipment & Labor
- Air Handling Unit Startup, Testing, Documentation, Training, Acceptance, etc.
- Other HVAC Equipment & Labor
- Other HVAC Equipment Startup, Testing, Documentation, Training, Acceptance, etc.
- Chemical Treatment Materials & Labor
- Chemical Treatment Startup, Testing, Documentation, Training, Acceptance, etc.
- Controls Shop Drawings
- Controls Materials & Labor
- Controls Startup, Commissioning, Testing, Documentation, etc.
- Controls Training and Acceptance
- Test and Balance Initial Report, Final Report and Acceptance

PART 14 – CHANGES IN MECHANICAL WORK:

14.1 REFER TO GENERAL AND SPECIAL CONDITIONS.

PART 15 – CLAIMS FOR EXTRA COST:

15.1 REFER TO GENERAL AND SPECIAL CONDITIONS.

PART 16 – MATERIALS AND WORKMANSHIP:

16.1 All equipment, materials and articles incorporated in the work shall be new and of comparable quality to that specified. Each Bidder/Proposer shall determine that the materials and/or equipment they propose to furnish can be brought into the building(s) and installed within the space available. In certain cases, it may be necessary to remove and replace walls, floors and/or ceilings and/or disassemble/reassemble the materials and equipment and this work shall be the responsibility of the Contractor, whether specifically initiated or not.

16.2 All equipment shall be installed so that all parts are readily accessible for inspection, maintenance, replacement of fans, motors, coils, filters, etc. Extra compensation will not be allowed for relocation of equipment for accessibility or for dismantling equipment to obtain entrance into the building(s). Ensure, through coordination that no other Contractor seals off access to space required for equipment materials, etc.

16.3 Materials and equipment shall bear Underwriters' Laboratories label where such a standard has been established, where applicable.

16.4 Each length of pipe, fitting, trap, fixture, and device used in the plumbing or drainage systems shall be stamped or indelibly marked with the weight or quality thereof and with the manufacturer's mark or name.

16.5 All equipment shall bear the manufacturer's name and address. All electrically operated equipment shall bear a name plate indicating required horsepower, voltage, phase, and ampacity. Pumps and fans shall have a data plate indicating horsepower, pressure, and flow rate.

PART 17 – HAZARDOUS MATERIALS:

17.1 The Contractor is hereby advised that it is possible that asbestos and/or other hazardous materials are or were present in this building or site.

17.2 Any worker, occupant, visitor, inspector, etc., who encounters any material of whose content they are not certain shall promptly report the existence and location of that material to the Contractor and/or Owner. The Contractor shall, as a part of their work, ensure that their workers are aware of this potential and what they are to do in the event of suspicion. The Contractor shall also keep uninformed persons from the premises during construction. Furthermore, the Contractor shall ensure that no one comes near to or in contact with any such material or fumes therefrom until its content can be ascertained to be non-hazardous.

17.3 CMTA, Inc., Consulting Engineers, have no expertise in the determination of the presence of hazardous materials. Therefore, no attempt has been made by them to identify the existence or location of any such material. Furthermore, CMTA nor any affiliate thereof will neither offer nor make any recommendations relative to the removal, handling, or disposal of such material.

17.4 If the work interfaces, connects or relates in any way with or to existing components which contain or bear any hazardous material, asbestos being one, then, it shall be the Contractor's sole responsibility to contact the Owner and so advise them immediately.

17.5 The Contractor by execution of the contract for any work and/or by the accomplishment of any work thereby agrees to bring no claim relative to hazardous materials for negligence, breach of contract, indemnity, or any other such item against CMTA, its principals, employees, agents, or

consultants. Also, the Contractor further agrees to defend, indemnify, and hold CMTA, its principals, employees, agents, and consultants, harmless from any such related claims which may be brought by any subcontractors, suppliers or any other third parties.

17.6 No asbestos or mercury containing materials shall be installed in this project.

17.7 It is the policy of the University of Louisville that no asbestos - containing materials are to be purchased by the University, supplied by any person supplying to the University or installed in or on university property by any person performing work for the University of Louisville. Furthermore, all products marked “May contain Mineral Fiber” will be assumed to contain asbestos unless the manufacturer provides written certification that no asbestos fibers are present in the product and identifies the fibers for which the product is marked. An exception to this rule can be made where a faculty or staff member certifies that the use of asbestos is essential to an ongoing research or production project and works with Environmental Health and Safety Department to ensure that the material is used, stored, and disposed of in safe and legal manner.

PART 18 – TEMPORARY SERVICES:

18.1 The Contractor shall arrange any temporary water, electrical and other services which may be required to accomplish the work. Refer also to General and Special Conditions.

18.2 All temporary services shall be removed by Contractor prior to completion of work.

PART 19 – SURVEY, MEASUREMENTS AND GRADE:

19.1 The Contractor shall lay out their work and be responsible for all necessary lines, levels, inverts, elevations, and measurements. The Contractor must verify the figures shown on the Plans before laying out the work and will be held responsible for any error resulting from failure to do so.

19.2 The Contractor shall base all measurements, both horizontal and vertical from established benchmarks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the work.

19.3 Should the Contractor discover any discrepancy between actual measurements and those indicated which prevents following good practice or the intent of the contract documents, the Contractor shall promptly notify the Engineer and shall not proceed with this work until the Contractor has received instructions from the Engineer on the disposition of the work.

PART 20 – PROTECTION OF EQUIPMENT:

20.1 The Contractor shall be entirely responsible for all material and equipment they furnish in connection with their work and special care shall be taken to properly protect all parts thereof from damage during the construction period. Such protection shall be by a means acceptable to the Engineer. All piping, etc., shall be properly plugged or capped during construction in a manner approved by the Engineer. Equipment damaged, stolen, or vandalized while stored on site, either before or after installation, shall be repaired or replaced by the Contractor at their expense. All ductwork with open ends shall be covered with plastic during construction.

PART 21 – REQUIRED CLEARANCES FOR ELECTRICAL EQUIPMENT:

21.1 The NEC has specific required clearances above, in front, and around electrical gear, panels etc. The Contractor shall not install any piping, ductwork, etc., in the required clearance. If any appurtenance is located in the NEC required clearance, it shall be relocated at no additional cost. Coordinate with the Electrical Contractor prior to any work.

PART 22 – EQUIPMENT SUPPORT:

22.1 Each piece of equipment, apparatus, piping, or conduit suspended from the ceiling or mounted above the floor level shall be provided with suitable structural support, pipe stand, platform, or carrier in accordance with the best recognized practice. Such supporting or mounting means shall be provided by the Contractor for all equipment and piping. Exercise extreme care that structural members of building are not overloaded by such equipment. Provide any required additional bracing, cross members, angles, support, etc. Do not support items from roof/floor deck or bridging.

PART 23 – DUCT AND PIPE MOUNTING HEIGHTS:

23.1 All exposed or concealed ductwork, piping, etc., shall be held as high as possible unless otherwise noted and coordinated with all other trades. Exposed piping and ductwork shall, insofar as possible, run perpendicular or parallel to the building structure. Refer to Plans for minimum heights of ducts and piping. Minimum height above ceilings shall be 6” clear including insulation, unless otherwise noted.

PART 24 – BROKEN LINES AND PROTECTION AGAINST FREEZING:

24.1 No conduits, piping, etc. carrying water or any other fluid subject to freezing shall be installed in any part of the building where danger of freezing may exist without adequate protection being given by the Contractor whether or not insulation is specified or indicated on the particular piping. All damages resulting from broken and/or leaking lines shall be replaced or repaired at the Contractor's own expense. Do not install piping across or near openings to the outside whether or not they are carrying static or moving fluids. Insulation on piping does not necessarily ensure that freezing will not occur. If in doubt, contact the Engineer.

PART 25 – WEATHERPROOFING:

25.1 Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as specified and approved by the Architect and Engineer before work is performed. The Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings permanently watertight.

25.2 Wherever work penetrates roofing, it shall be done in a manner that will not diminish or void the roofing guarantee or warranty in any way. Coordinate all such work with the roofing installer.

PART 26 – FINAL CONNECTIONS TO EQUIPMENT:

26.1 The Contractor shall finally connect mechanical services (water, sanitary, gas, air, etc.), to any terminal equipment, appliances, kitchen equipment, etc., provided under this and/or other divisions of the work. Various equipment connections indicated are based upon “basis of design” equipment selections. Should alternate equipment be purchased by the General Contractor, then this Contractor shall make the necessary provisions in the Bid for any and all differences. Change Orders shall not be considered for any differences due to alternate equipment purchase. Such connections shall be made in strict accord with current codes, safety regulations and the equipment manufacturer’s recommendations. If in doubt, contact the Engineer prior to installation.

PART 27 – ACCESSIBILITY:

27.1 The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in double partitions and ceilings for the proper installation of their work. They

shall cooperate with all others whose work is in the same space. Such spaces and clearances shall, however, be kept to the minimum size required.

27.2 The Contractor shall locate and install all equipment so that it may be serviced and maintained as recommended by the manufacturer. Allow ready access and removal of the entire unit and/or parts such as valves, filters, fan belts, motors, prime shafts, controls, coils, etc.

27.3 Whether shown on the Plans or not, the Contractor shall provide in the Bid access panels for each concealed shut-off valve, motorized control damper, manual air damper or other device requiring service as shown on Engineer's Plans or as required. Locations of these panels shall be identified in sufficient time to be installed in the normal course of work. Change orders for access panels will not be accepted.

PART 28 – SCAFFOLDING, RIGGING AND HOISTING:

28.1 The Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery onto the premises of any equipment and apparatus furnished. All such temporary appurtenances shall be set up in strict accord with OSHA Standards and Requirements. Remove same from premises when no longer required.

PART 29 – CONCRETE WORK:

29.1 The Contractor shall be responsible for the provisions of all concrete work required for the installation of any of their systems or equipment. The Contractor may, at their option, arrange with the others to provide the work. This option, however, will not relieve the Contractor of their responsibilities relative to dimensions, quality of workmanship, locations, etc.

29.2 In the absence of other concrete Specifications, all concrete related to Mechanical work shall be 3500 psi minimum compression strength at 28 days curing, slump: 4” ± 1”, air entrainment 4.5% water to cement ratio 0.5 and shall conform to the standards of the American Concrete Institute Publication AC1-318. Heavy equipment shall not be installed on pads for at least seven (7) days after pour.

29.3 All concrete pads shall be complete with all pipe sleeves, anchor bolts, reinforcing steel, concrete, etc. as required. Pads larger than 18" in width shall be reinforced with ½" deformed round bars on 6" centers both ways. Bars shall be approximately 2" above the bottom of the pad. All parts of pads and foundations shall be properly rodded or vibrated. If exposed parts of the pads and foundations are rough or show honeycomb after removing forms, all surfaces shall be rubbed to a smooth surface. Chamfer all vertical edges ¾” and tool horizontal edges with ¾” radius.

29.4 In general, unless otherwise noted, concrete pads for equipment shall be 4” thick, extend six (6) inches beyond the equipment's base dimensions. Where necessary, extend pads 30 inches beyond base or overall dimensions to allow walking and servicing space. Insert 6-inch steel dowel rods into new and existing floors to anchor pads.

29.5 Exterior concrete pads shall be 8” thick with four (4) inches minimum above grade and four (4) inches below grade on a compacted four (4) inch dense grade rock base unless otherwise indicated or specified. Surfaces of all foundations and bases shall have a smooth finish with one-half (½) inch chamfer on exposed edges. Turn down edges 18” below grade.

29.6 Provide yellow hazard lines around all concrete pads.

PART 30 – RESTORATION OF NEW OR EXISTING LANDSCAPING, PAVING, SURFACES, ETC.:

30.1 The Contractor shall at their expense restore to their original conditions all paving, curbing, surfaces, drainage ditches, structures, fences, landscaping, existing or new building surfaces and

appurtenances, and any other items damaged or removed by their operations. Replacement and repairs shall be in accordance with good construction practice; by qualified tradesman and shall match materials employed in the original construction of the item and shall be to the satisfaction of the Owner and/or Engineer.

PART 31 – MAINTENANCE OF EXISTING UTILITIES AND LINES:

31.1 The locations of all piping, conduits, cables, utilities, and manholes existing, or otherwise, that comes within the contract construction site, shall be subject to continuous uninterrupted service with no other exception than the Owner of the utilities permission to interrupt same temporarily. Provide a seven (7) day written notice to Engineer, Architect and Owner prior to interrupting any utility service or line.

31.2 Known utilities and lines as available to the Engineer are shown on the Plans. However, it is additionally required that, prior to any excavation being performed, each Contractor ascertain and mark all utilities or lines that would be endangered by the excavation. Hand dig if required to locate. Contractor shall bear costs of repairing damaged utilities.

31.3 If utilities or lines occur in the earth within the construction site, the Contractor shall probe and locate the lines prior to machine excavation in the respective area. Hand dig if required to locate.

31.4 Cutting into existing utilities and services shall be performed in coordination with and as designated by the Owner of the utility. The Contractor shall work continuously to restore service(s) upon deliberate or accidental interruption, providing premium time and materials as needed without extra claim to the Owner.

31.5 The Contractor shall repair to the satisfaction of the Owner and Engineer, any surfaces or subsurface improvements damaged during the course of the work, unless such improvement is shown to be abandoned or removed.

31.6 Machine excavation shall not be permitted with ten feet of gas lines, fuel lines, electrical lines or lines carrying combustible and/or explosive materials. Hand excavate only in accord with utility company, agency or other applicable laws, standards or regulations.

31.7 Protect all new or existing lines from damage by traffic, etc. during construction. Repairs or replacement of such damage shall be at the sole expense of the party responsible.

31.8 Protect existing trees, indicated to remain with fencing or other approved method. Hold all new subsurface lines outside the drip line of trees, offsetting as necessary to protect root structures. Refer to planting or landscaping plans, or in their absence, consult with the Architect.

PART 32 – CLEANING:

32.1 The Contractor shall, at all times, keep the area of their work presentable to the public and clear from rubbish and debris caused by their operations; and at the completion of the work, they shall remove all rubbish, debris, all of their tools, equipment, temporary work and surplus materials from and about the premises, and shall leave the area clean and ready for use. If the Contractor does not attend to such cleaning upon request, the Engineer may cause cleaning to be done by others and charge the cost of same to the Contractor. The Contractor shall be responsible for all damage from fire which originates in, or is propagated by, accumulations of their rubbish or debris.

32.2 After completion of all work and before final acceptance of the work, the Contractor shall thoroughly clean all equipment and materials and shall remove all foreign matter such as grease, dirt, plaster, labels, stickers, etc., from the exterior of piping, equipment, fixtures and all other associated or adjacent fabrication.

32.3 Ductwork and piping shall be kept clean at all times. Ductwork stored on the job site shall be placed a minimum of 4" above the floor and the open ends shall be completely covered in plastic. Open ends of installed ductwork shall be protected with plastic. Do not install the ductwork or insulation (pipe or duct) if the building is not "dried-in". The Owner/Engineer shall periodically inspect that these procedures are followed. If deemed unacceptable, the Contractor shall be required to clean the duct system utilizing a NADCA certified Contractor.

PART 33 – TEMPORARY USE OF EQUIPMENT:

33.1 The permanent heating and plumbing equipment, when installed, may be used for temporary services, with the consent of the Engineer. Use of the permanent equipment shall be dependent upon the cleanliness of the job site as determined by Owner, Architect and Engineer. Should the permanent systems be used for this purpose the Contractors shall make all temporary connections required at their expense. They shall also make any replacement required due to damage wear and tear, etc., leaving the same in "as new" condition.

33.2 Permission to use the permanent equipment does not relieve the Contractors from the responsibility for any damages to the building construction and/or equipment which might result because of its use.

33.3 Warranties shall begin at substantial completion regardless of temporary use of equipment or not.

33.4 A pre-start-up conference shall be held in accordance with EQUIPMENT/CONTROLS START-UP AND VERIFICATION in this section.

33.5 For Air Handling Units during all phases of construction:

- At a minimum, four complete sets of filter media are required for each unit. In each unit, install two sets of filter media during construction (more shall be required if construction activities dictate more frequent changes). In each unit, install one set of filter media at substantial completion. Leave one set of filter media in boxes in appropriate mechanical room as a spare set for the Owner. All other filters shall be used by the Contractor during construction. Dispose of all construction filter media.
- On the outside of all return air openings install a minimum of two sets of fiberglass filter media, such as cheesecloth, to be utilized as pre-filters for the "construction" filters. Install first set upon start-up and then install second set when first set is dirty. Dispose of all dirty construction filters. Change filters as often as necessary to keep units from becoming dirty at no additional cost.
- At substantial completion of the project the entire unit shall be cleaned to present a like "new" unit for the Owner and all filters shall be replaced with new.

33.6 For Heat Pump Units during all phases of construction:

- At a minimum, four complete sets of filter media are required for each unit. In each unit, install two sets of filter media during construction (more shall be required if construction activities dictate more frequent changes). In each unit, install one set of filter media at substantial completion. Leave one set of filter media in boxes in appropriate mechanical room as a spare set for the Owner. All other filters shall be used by the Contractor during construction. Dispose of all construction filter media.
- On the outside of all exhaust air openings install a minimum of two sets of fiberglass filter media, such as cheesecloth, to be utilized as pre-filters for the "construction" filters. Install first set upon start-up and then install second set when first set is dirty. Dispose of all dirty construction filters. Change filters as often as necessary to keep units from becoming dirty at no additional cost.
- At substantial completion of the project the entire unit shall be cleaned to present a like "new" unit for the Owner and all filters shall be replaced with new.

PART 34 – NOISE, VIBRATION OR OSCILLATION:

34.1 All work shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Engineer. In case of moving machinery, sound, or vibration noticeable outside of room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Engineer shall be corrected in an approved manner by the Contractor at their expense.

34.2 All equipment subject to vibration and/or oscillation shall be mounted on vibration supports whether indicated or not suitable for the purpose of minimizing noise and vibration transmission and shall be isolated from external connections such as piping, ducts, etc. by means of flexible connectors, vibration absorbers, or other approved means.

34.3 Unitary equipment, such as room units, exhaust fans, etc., shall be rigidly braced and mounted to wall, floor or ceiling as required and tightly gasketed and sealed to mounting surface to prevent air leakage and to obtain quiet operation. Flush and surface mounted equipment such as diffusers, grilles, etc., shall be gasketed and affixed tightly to their mounting surface.

34.4 The Contractor shall provide supports for all equipment they furnish. Supports shall be liberally sized and adequate to carry the load of the equipment and the loads of attached equipment, piping, etc. All equipment shall be securely fastened to the structure either directly or indirectly through supporting members by means of bolts or equally effective means. If strength of supporting structural members is questionable, contact Engineer.

PART 35 – EQUIPMENT/CONTROLS STARTUP & VERIFICATION:

35.1 The Contractor and their Subcontractors shall include in the bid to provide equipment and controls startup and verification for ALL Mechanical Systems specified for this project.

35.2 A pre-start-up conference shall be held with the Architect, Engineer, Owner, General Contractor, Mechanical Contractor, Electrical Contractor, Controls Contractor, Test and Balance Contractor, and the Manufacturer's providing startup services. The purpose of this meeting will be to discuss the goals, procedures, etc. for start-up.

35.3 Specific line-items shall be included on the schedule of values by each Trade for "equipment and controls startup". These line-item values shall be approved by the Engineer. The Engineer, Owner and the Engineer's Field Inspector(s) shall closely monitor progress and quality of the equipment and controls startup and may withhold pay requests as deemed appropriate until satisfactorily completed.

35.4 Specific startup/verification specifications are included throughout the Mechanical Specifications. In general, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians, not third-party Contractors, and shall complete and submit start-up reports/checklists. The Contractor shall have appropriate trades on site to correct all deficiencies noted by the factory representative. For each deficiency noted, documentation of corrective action (including date and time) shall be submitted to the Engineer and Owner. Where factory start-up is not specified for a particular piece of equipment or system, the Contractor shall be responsible to perform start-up. All information shall be completed by the Contractor and submitted to the Owner/Engineer prior to acceptance of the equipment.

35.5 The Contractor shall be responsible for completion of System Verification Checklists/Manufacturer's Checklists. Factory startup is required for all HVAC equipment noted. Unless noted otherwise, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians and shall complete and submit start-up reports/checklists. This shall include the following:

- Heat Pumps
- Variable Frequency Drives
- Split Systems
- Packaged Rooftop Units
- Kitchen Rangehood, Make Up Air Units and Exhaust Fans

35.6 Except for the specific equipment specified in this Specification Section, the manufacturer's recommended startup procedures and checklists will be acceptable for use in the project. Where "manufacturer" startup is not specified, then this Contractor shall perform startup services in strict accordance with manufacturer's instructions. All startup/verification process shall be thoroughly documented by the Contractor and shall include the time and date when performed.

35.7 The Contractor shall "zip-tie" a start-up report to each piece of equipment in a clear plastic cover. Once start-up completion is verified by the Engineer the Contractor shall remove all reports and consolidate them into close-out documentation. The Contractor shall be responsible for completion of System Verification Checklist (SVC) / Manufacturer's Checklists.

PART 36 – INSPECTION, APPROVALS AND TESTS:

36.1 Before requesting a final review of the installation from the Architect and/or Engineer, each Contractor shall thoroughly inspect their installations to assure that the work is complete in every detail and that all requirements of the Contract Documents have been fulfilled. Failure to accomplish this may result in charges from the Architect and/or Engineer for unnecessary and undue work on their part.

36.2 The Contractor shall provide as a part of this Contract any required Agency inspection, licensed, and qualified to provide such services. All costs incidental to the provisions of inspections shall be borne by the Contractor.

36.3 The Contractor shall advise each Inspecting Agency in writing, with an informational copy of the correspondence to the Architect and/or Engineer, when they anticipate commencing the work. Inspections shall be scheduled for rough-in as well as finished work. The rough-in inspections shall be divided into as many inspections as may be necessary to cover all rough-in without fail. Failure of the Inspecting Agency to inspect the work in a timely manner and submit the related reports may result in the Contractor having to expose concealed work not so inspected. Such exposure will be at the expense of the responsible Contractor.

36.4 Approval by an Agency Inspector does not relieve the Contractor from the responsibilities of furnishing equipment having a quality of performance equivalent to the requirements set forth in these Plans and Specifications. All work under this contract is subject to the review of the Architect and/or Engineer, whose decision is binding.

36.5 Before final acceptance, the Contractor shall furnish the original and three (3) copies of the certificates of final approval by the Agency Inspector to the Engineer with one copy of each to the appropriate government agencies, as applicable. Final payment for the work shall be contingent upon completion of this requirement.

PART 37 - ABOVE-CEILING AND FINAL PUNCH LISTS:

37.1 The Contractor shall review each area and prepare and complete their own punch list for each of the subcontractors as required for the Project Schedule.

37.2 Seven (7) days notice shall be given to the Engineer for review of above ceiling work that will be concealed by tile or other materials. Seven (7) days notice shall be given to the Engineer for review of below ceiling work and final inspection.

37.3 When all work from the Contractor's punch list is complete at each of the major Project Stages and prior to completing ceiling installations (or at the final punch list stage), the Contractor shall request that the Engineer develop a punch list. This request is to be made in writing seven (7) days prior to the proposed date. After all corrections have been made from the Engineer's punch list, the Contractor shall review and initial off on each item. This signed-off punch list shall be submitted to the Engineer. The Engineer shall return to the site once to review each punch list and all work prior to the ceilings being installed and at the final punch list review. The Contractor's representative may be requested at the inspections.

37.4 If additional visits are required by the Engineer to review work not completed by this review, the Engineer shall be reimbursed directly by the Contractor by check or money order (due next 10 days from date of each additional visit) at a rate of $125.00 per hour plus travel expense for extra trips required to complete either of the above ceiling, below ceiling or final punch lists.

PART 38 – OPERATING INSTRUCTIONS:

38.1 Upon completion of all work and all tests, each Contractor shall furnish the necessary skilled labor and helpers for operating the systems and equipment for a period of three (3) days of eight (8) hours each, or as otherwise specified. Refer to Section HVAC EQUIPMENT for additional requirements. During this period, instruct the Owner or their representatives fully in the operations, adjustment, and maintenance of all equipment furnished. Give at least seven (7) days written notice to the Owner, Architect and Engineer in advance of this training period. The Engineer may attend any such training sessions or operational demonstrations. The Contractor shall certify in writing to the Engineer that such demonstrations have taken place, noting the date, time and names of the Owner's representatives that were present.

38.2 Each Contractor shall furnish three complete bound sets for approval to the Engineer instructions for operating and maintaining all systems and equipment included in this contract. All instructions shall be submitted in draft form, for approval, prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions. Refer to Specification Section SHOP DRAWINGS for additional detail.

38.3 Each Contractor, in the above mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this contract and a detailed, easy to read parts list and the name and address of the nearest source of supply.

PART 39 – RECORD DRAWINGS:

39.1 The Contractor shall ensure that any deviations from the Design are as they occur recorded in red, erasable pencil on record drawings kept at the jobsite. The Engineer shall review the record documents from time to time to ensure compliance with this specification. Compliance shall be a contingency of final payment. Pay particular attention to the location of under floor sanitary and water lines, shut-off valves, cleanouts, and other appurtenances important to the maintenance and operation of Mechanical Systems. Also, pay particular attention to Deviations in the Control Systems and all exterior utilities. Keep information in a set of drawings set aside at the job site especially for this purpose and deliver to the Engineer upon completion of the work.

39.2 All underground utilities/piping installed as part of this project shall be surveyed by a land surveyor licensed in the State in which the project is being constructed. This shall include underground geothermal piping mains, vaults, and vertical bore locations. The survey shall include actual pipe depths to top of pipe every 100 feet in length. The survey shall also include benchmarks dimensions relative to above grade, fixed structures. The survey shall be furnished on a compact disc in AutoCad ".dwg" format and ".pdf" format. The survey information shall be included in the closeout documentation.

PART 40 - COMMISSIONING: CONTRACTOR RESPONSIBILITIES:

40.1 Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

- Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
- Cooperate with the CxA for resolution of issues recorded in the Issues Log.
- Attend commissioning team meetings.
- Integrate and coordinate commissioning process activities with construction schedule.
- Complete electronic construction checklists as Work is completed and provide to the Commissioning Authority.
- Review and accept commissioning process test procedures provided by the Commissioning Authority.
- Complete commissioning process test procedures.

PART 41 – COORDINATION DRAWINGS:

41.1 Detailed electronic coordination drawings shall be required for this project. A specific line-item shall be included on the schedule of values by each Trade for “preparation of coordination drawings”. This line-item value shall be approved by the Engineer. The Engineer and the Engineer’s Field Inspector shall monitor progress of the preparation of the electronic coordination drawings and may withhold pay requests as deemed appropriate. Coordination drawings are a tool for the Contractor and will not review by the Engineer unless the Contractor has specific questions. The Engineer will not review or approve the Contractor’s coordination drawings. They are a tool for the Contractor.

41.2 Coordination Drawings shall be provided on this project by each Trade. Drawings shall be 30x42 sheet size and shall be at ¼” scale and shall match the drawing setup as included in the Architectural Drawings. Drawings shall be prepared in electronic format. The Architect and Engineer will supply electronic drawings files of the Contract Documents upon the Contractor’s request and release.

41.3 The basis for the Coordination Drawings shall be the sheet metal ductwork fabrication shop drawings, all electrical feeder conduits, and other conduits 2” and larger, and any gravity drainage systems and components in ceiling spaces. The Coordination Drawings shall be prepared by the Mechanical Contractor. The Coordination Drawings shall indicate (1) systems above ceilings in finished areas, (2) systems supported from the structure in finished areas without ceilings, (3) systems in the mechanical rooms, and (4) all wall, roof, floor penetrations. These drawings shall indicate all ductwork as double lined with bottom elevations noted.

41.4 The sheet metal fabrication shop drawings shall be completed in a timely manner so as not to conflict with construction schedule and phasing plan. At the Prime Contractor’s discretion, these drawings shall be completed in phases to correspond with the project construction work sequencing. The Mechanical Contractor shall furnish an electronic copy of these ductwork shop drawings to all other Trades, specifically the Fire Protection and Electrical and other Contractors as requested by the Prime Contractor for the purpose of including other trades work on the Coordination Drawings.

41.5 Pre-Coordination Meetings with all necessary trades shall occur. During these meetings, the Contractors shall discuss locations/elevations where piping, conduits, cable path, etc will be installed with respect to the sheetmetal fabrication drawings and other trades. The sheetmetal ductwork and gravity piping systems shall be given the first priority. Each Trade shall provide the Mechanical Contractor electronic drawings of all their systems (with elevation noted), coordinated

with the ductwork and other trades for them to incorporate into the Coordination Drawings. Coordination Meetings shall then occur so that all conflicts can be resolved between Trades. All conflicts shall be resolved between all Trades at these Coordination Meetings and the Mechanical Contractor shall then amend the Drawings to include the Final Coordinated Work.

41.6 It is realized that not all systems can be completely detailed. The coordination drawings shall include the following at a minimum:

- All supply/return/exhaust ductwork.
- All above slab sanitary, roof drainage piping and other gravity drainage systems.
- HVAC, fire protection and domestic water piping which are 1.5” in size and greater, excluding insulation.
- Electrical conduits which are 1.5” in size and greater.
- Cable tray and bridal ring paths.
- Multiple smaller piping/conduits hung on a common trapeze hanger.
- All wall, roof, floor penetrations.

41.7 After completion of the Final Coordination Drawings, a Final Review with all Trades shall occur to provide any final comments and approval by all Trades. Other interim coordination meetings will be required to ensure successful coordination drawings. Any additional coordination items will be updated by the Mechanical Contractor. The Final Approved Coordination Drawings shall be distributed electronically to each Trade by the Mechanical Contractor. The Mechanical Contractor shall also furnish a complete 30x42 paper set of drawings to the jobsite main office and shall utilize them for updates of field conditions/deviations that occur during construction. Final Approved Coordination Drawings shall also be distributed to the Prime Contractor, Owner, Architect and Engineer for their Records. This process shall be completed prior to starting any work.

41.8 Each Contractor shall ensure that any deviations from the Coordination Drawings are recorded as they occur, in red erasable pencil on Coordination Drawings kept at the jobsite. Upon completion of a particular phase, the Mechanical Contractor shall incorporate all field deviations into the Coordination Drawings to be utilized as Record Drawings. The Engineer shall review the Record Documents from time to time to ensure compliance with this specification. Compliance shall be a contingency of final payment. Pay particular attention to the location of under floor sanitary and water lines, shut-off valves, cleanouts, and other appurtenances important to the maintenance and operation of Mechanical Systems. Also, pay particular attention to Deviations in the Control Systems and all exterior utilities. Keep information in a set of drawings set aside at the job site especially for this purpose. The Record Drawings shall be distributed electronically to the Prime Contractor, Owner, Architect and Engineer for their Records.

41.9 The mechanical contractor is responsible to the general contractor for the shop drawing layout of the following rooms and details:

- Concrete pads and foundations
- Equipment room layouts with actual equipment
- Roof layouts
- Congested areas above ceilings adjacent to mechanical and electrical room
- Dimensioned ductwork shop drawings

41.10 The electrical contractor is responsible to the general contractor for the shop drawing layout of the following rooms and details:

- Concrete pads and foundations
- Equipment room layouts with actual equipment
- Routes of feeders conduits and all other conduits 1.5” and larger
- Bridle ring cabling paths
- Trench locations and size
- Congested areas above ceilings adjacent to mechanical and electrical rooms

41.11 The contractor's final coordination drawings shall be coordinated with actual field conditions, as examined, and verified by the contractor following completion of demolition. The contractor shall complete coordination drawings in phases as required to accommodate sequencing of construction, shop drawing review and approval, etc. as required for the contractor to maintain the construction schedule.

END OF SECTION 200100

SECTION 200200 - SCOPE OF THE MECHANICAL WORK

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS – MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 The Mechanical work for this Contract shall include all labor, materials, equipment, fixtures, excavation, backfill and related items required to completely install, test, place in service and deliver to the Owner the complete mechanical systems in accordance with the accompanying plans and all provisions of these specifications. This work shall primarily include but is not necessarily limited to the following paragraphs.

1.3 All applicable services and work specified in GENERAL PROVISIONS - MECHANICAL.

1.4 Installation of all equipment per the manufacturer’s instruction, whether specifically detailed or not.

1.5 Provide all required motor starters, etc. not provided under the electrical sections.

1.6 Thorough instruction of the Owner’s maintenance personnel in the operation and maintenance of all mechanical equipment.

1.7 Thorough coordination of the installation of all piping, ductwork, equipment, and any other material with other trades to ensure no conflict in installation.

1.8 Approved supervision of the mechanical work.

1.9 Procurement of all required inspections, including fees for all inspection services and submission of final certificates of inspection to the Engineers.

1.10 Excavation, backfilling, cutting, patching, sleeving, concrete work, etc., required to construct the mechanical systems.

1.11 Equipment and controls start-up, verification and documentation as specified.

1.12 Record drawings, final inspection certificates, test results, O & M documentation, warranty certification, spare parts and other specified closeout documentation.

1.13 Required schedule of values breakdown.

1.14 Pipe, duct and equipment identifications.

1.15 Preinstallation meetings and equipment mockups.

1.16 Specified Commissioning activities.

1.17 Complete exterior sanitary sewer system connected to the local system/utility.

1.18 Complete exterior fire protection system connected to the local system/utility.

1.19 Complete exterior natural gas system connected to the local system/utility.

1.20 Complete domestic water service to 5’-0” beyond building footprint. Refer to Civil Drawings/Specifications for additional requirements.

1.21 Complete storm sewer service to 5’-0” beyond building footprint. Refer to Civil Drawings/Specifications for additional requirements.

1.22 Domestic hot, cold, and recirculating hot water system.

1.23 Soil, waste, and vent systems.

1.24 Roof drainage systems.

1.25 All plumbing equipment, fixtures, and fittings.

1.26 100% automatic sprinkler systems.

1.27 Complete heating, ventilation, and air conditioning systems.

1.28 All mechanical exhaust systems.

1.29 All insulation associated with mechanical systems.

1.30 Condensate drainage systems.

1.31 All required pressure testing, flushing, purging, pressure and flow testing requirements.

1.32 Final coordination and connection of all mechanical equipment furnished by others (e.g., kitchen equipment, appliances, medical equipment).

1.33 Complete natural gas piping systems.

1.34 All required controls, including self checkout and commissioning.

END OF SECTION 200200

SECTION 200300 - SHOP DRAWINGS, MAINTENANCE MANUALS AND PARTS LISTS

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS – MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 The Contractor shall prepare and submit to the Engineer, through the Prime Contractor and the Architect within thirty (30) days after the date of the Contract, required copies of all shop drawings, certified equipment drawings, installation, operating and maintenance instructions, samples, wiring diagrams, etc. on all items of equipment specified hereinafter. Refer to Division 1 requirements for shop drawing submittal requirements.

1.3 Provide all shops in electronic/PDF format. The Engineer’s comments will be returned in electronic format.

1.4 Each shop drawing and/or manufacturers descriptive literature shall have the proper notation indicated on it selecting equipment, accessories and features and shall be clearly referenced to the specifications, schedules, fixture numbers, etc., so that the Engineer may readily determine what the Contractor proposes to furnish. All data and information schedules indicated or specified shall be noted on each copy of each submittal.

1.5 Submittal data shall include specification data including metal gauges, finishes, accessories, etc. Also, the submittal data shall include certified performance data, wiring diagrams, dimensional data, and a spare parts list. Submittal data shall be reviewed by the Engineer before any equipment or materials is ordered or any work is begun in the area requiring the equipment.

1.6 All submittal data shall have the stamp of approval of the Contractor submitting the data as well as the Prime Contractor and the Architect to show that the drawings have been reviewed by the Contractor. Any drawings submitted without these stamps of approval may not be considered and will be returned for proper resubmission.

1.7 The Contractor shall make any corrections or changes required by the Engineer and shall re-submit for final review as outlined above.

1.8 It shall be noted that review of shop drawings by the Engineer applies only to conformance with the design concept of the project and general compliance with the information given in the Contract Documents. In all cases, the Contractor alone shall be responsible for furnishing the proper quantity of equipment and/or materials required, for seeing that all equipment fits the available space in a satisfactory manner and that piping, electrical and all other connections are suitably located. The Contractor shall also coordinate piping side connections.

1.9 The Engineer’s review of shop drawings, schedules or other required submittal data shall not relieve the Contractor from responsibility for adaptability of the item to the project; compliance with applicable codes, rules, regulations, and information that pertains to fabrication and installation; dimensions. weight and quantities; electrical characteristics; and coordination of the work with all other trades involved in this project.

1.10 Prior to ordering any materials or rough-in of any kind, the Mechanical Contractor shall be responsible for final coordination of all electrical requirements (i.e., voltage, phase, circuit breaker, wire sizing, etc.) with the Electrical Contractor. There will be no change in the Contract Amount for any discrepancies. A final coordination meeting shall be held with the Architect,

Owner, Engineer, Prime Contractor, Mechanical Contractor, Electrical Contractor, and their sub-contractors.

1.11 Equipment shall not be ordered and no final rough-in connections, etc., shall be accomplished until reviewed equipment shop drawings are in the hands of the Contractor. It shall be the Contractor's responsibility to obtain reviewed shop drawings and to make all connections, etc. in the neatest and most workmanlike manner possible. The Contractor shall coordinate with all the other trades having any connections, roughing-in, etc. to the equipment.

1.12 If the Contractor fails to comply with the requirements set forth above, the Engineer shall have the option of selecting any or all items listed in the Specifications or on the Drawings; and the Contractor shall be required to furnish all materials in accordance with this list.

1.13 Colors for equipment in other than mechanical spaces shall be selected from the Manufacturer's standard and factory optional colors unless noted otherwise on the Plans. Color samples shall be furnished with the shop drawing submission for such equipment.

1.14 All submittals for mechanical equipment shall include all information specified and scheduled. This shall include air and water pressure drops, RPM, noise data, face velocities, horsepower, voltage motor type, steel or aluminum construction, and all accessories clearly marked.

1.15 All items listed in the schedules shall be submitted for review in a tabular form similar to the equipment schedule. All items submitted shall be designated with the same identifying tag as specified on each sheet.

1.16 Any submittals received in an unorganized manner without options to be provided specifically noted and with incomplete data will be returned for resubmittal.

PART 2 – SHOP DRAWINGS:

2.1 Shop Drawings, descriptive literature, technical data and required schedules shall be submitted on the following:

Access Doors
Air Filtration & Components
Air Handling Units
Cabinet Heaters
Chemical Treatment and Test Reports
Double Wall Ductwork
Ductless Split Systems
Ductwork Accessories/Volume Dampers
Exhaust Fans
Fire Protection Sprinkler System (2.2.3)
Firestopping (2.2.6)
Floor Drains
Heat Pump Units
Insulation
Kitchen Rangehood and Exhaust Air System (2.2.4)
Packaged Rooftop Units
Plumbing Fixtures, Fittings and Trim
Plumbing Specialties
Register, Grilles, Diffusers and Louvers
Roof Drains
Split Systems
System Verification Check Lists
Temperature Controls & Components (2.2.2)

Valves
Variable Frequency Drives
Water Heaters

(Refer to the corresponding Special Notes.)

2.2 SPECIAL NOTES:

2.2.1 For all items above, upon substantial completion of the project, the Contractor shall deliver to the Engineer (in addition to the required Shop Drawings) three (3) complete copies of operation and maintenance instructions and parts lists for each item above. Where available, documents shall include at least:

- Detailed operating instructions.
- Detailed maintenance instructions including preventive maintenance schedules.
- Addresses and phone numbers indicating where parts may be purchased.
- Expanded parts drawings, parts lists, service manuals, schematics, wiring diagrams.
- Master air filter list including equipment identification, filter size, filter quantity, and supplier contact information.
- Start-up reports, service records and test reports.

2.2.2 Shop drawings for the Temperature Control Systems shall include detailed, scaled plans and schematic diagrams indicating the function and operation of the system. Refer to Specification Section – CONTROLS for additional requirements.

2.2.3 Shop drawings for the Building Fire Protection System shall be prepared and stamped by a Certified Contractor and shall meet the criteria of the authority having jurisdiction and submitted to the Engineer. After the Engineer's review, they shall be submitted by the Contractor to the proper state authorities along with the required agency review fee. Refer to Specification Section – FIRE PROTECTION for additional requirements.

2.2.4 The Contractor shall submit shop drawings for the kitchen range hood system(s) along with all required supporting documentation agency and review fees to the authority having jurisdiction and receive approval prior to submittal to the Engineer. Refer to Specification Section – HVAC EQUIPMENT and Specification Section SHEETMETAL for additional requirements.

2.2.5 The Contractor shall submit shop drawings for the boilers along with all required supporting documentation and agency review fees to the authority having jurisdiction and receive approval prior to submittal to the Engineers.

2.2.6 The Contractor shall submit project specific UL listed firestopping installation drawings to the authority having jurisdiction where required for their approval as required.

END OF SECTION 200300

SECTION 200400 - DEMOLITION AND SALVAGE

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

2.1 It is the intent of this Section to completely remove all components of any existing mechanical system indicated in the mechanical drawings and items associated with the required architectural demolition specified in the Contract Documents. Also, any mechanical systems that will be open to view, or will interfere with the operations of the completed building, or which will, in any way, interfere with project construction shall be removed. The Contractor shall field verify existing conditions prior to bid.

PART 2 – PLUMBING DEMOLITION:

2.1 The general scope of the plumbing system demolition is indicated on the drawings. Where plumbing fixtures, equipment, etc. are removed, also remove all associated branch piping, hangers, insulation, concrete pads, controls, etc. Where plumbing fixtures are removed, all piping and services shall be removed in accordance with the current Building Code.

2.2 Refer to the demolition drawings for piping which shall be demolished or shall remain. If other piping is found during construction which is not indicated on the drawings, the fixtures the piping serves must be identified. If it serves fixtures which are being demolished, the piping shall be removed back to the nearest mains and capped. Verify this work with the Engineer prior to demolition.

2.3 The Contractor shall be responsible for the removal and/or relocation of any plumbing equipment, concrete pads, piping, drain lines, vent lines, valves, fittings, etc., which may in the course of construction, interfere with the installation of any new and/or relocated Architectural, Mechanical or Electrical Systems specified in the Contract Documents. This work shall be performed at no increase in the contract price.

2.4 Unless otherwise indicated, the Contractor shall be responsible for patching and repairing by all qualified tradesmen, all holes, etc. in the ceilings, walls, roof, and floors where plumbing equipment is removed.

2.5 All underslab pipes abandoned in place shall be made safe in compliance with the Plumbing Code. Above slab piping is not allowed to be abandoned and must be removed.

2.6 All plumbing equipment not indicated to be reused shall be removed.

PART 3 – HVAC DEMOLITION:

3.1 The general scope of the HVAC system demolition is indicated on the drawings. Where HVAC units are removed, also remove all associated ductwork, branch piping, hangers, insulation, concrete pads, controls, etc.

3.2 Refer to the demolition drawings for equipment, piping, and ductwork to be demolished or which shall remain. If other equipment, piping, or ductwork is found during construction which is not indicated on the drawings, it must be determined if these systems serve other areas not being renovated. If the equipment piping and ductwork serve only renovated areas, the system shall be demolished. Verify this work with the Engineer prior to demolition.

3.3 Remove all temperature controls, panels, accessories, etc. that are accessible or become accessible during construction that serves demolished systems. Remove all pneumatic control tubing, control wiring and conduits in the facility unless noted otherwise.

3.4 The Contractor shall be responsible for the removal and/or relocation of any HVAC piping, equipment, fittings, valves, etc. which may, in the course of construction, interfere with the installation of any new and/or relocated Architectural, Structural, Mechanical or Electrical Systems specified in the Contract Documents at no increase in the contract price.

3.5 Unless otherwise indicated, the Contractor shall be responsible for the patching and repairing by qualified tradesmen of all holes, etc. in the ceiling, wall, roof, and floors where HVAC equipment is removed.

3.6 Where piping and ductwork systems are partially demolished, cap systems air and watertight and insulate. All capping of duct systems shall be completed with 22 gauge sheet metal and insulated. Seal with duct sealant.

PART 4 – REFRIGERANT RECOVERY:

4.1 The Contractor shall have a licensed refrigerant recovery technician evacuate all refrigerants from all refrigeration equipment being removed in accordance with EPA guidelines and regulations. The Contractor shall take all necessary precautions to not accidentally vent refrigerants to the atmosphere. The refrigerant shall become the property of the Contractor.

PART 5 – SALVAGE:

5.1 It is the intent of this section to deliver to the Owner all components which may be economically reused by them. The Contractor shall make every effort to remove reusable components without damage.

5.2 Components to be delivered to the Owner shall be specifically identified by the Owner's representative prior to beginning the demolition. The Contractor shall prepare a letter of transmittal of all salvaged items and obtain the Owner's signature and date of receipt.

5.3 Owner salvage items shall include, but are not limited to the following:

- Terminal Heating/Cooling Equipment
- Control Panels
- Thermostats
- Controls

5.4 Other items become the property of the Contractor and are to be removed from the site and disposed of properly.

END OF SECTION 200400

SECTION 201100 - SLEEVING, CUTTING, PATCHING, REPAIRING AND FIRESTOPPING

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS – MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 The Contractor shall be responsible for all openings, sleeves, trenches, etc., that may be required in floors, roofs, ceilings, walls, etc., and shall coordinate all such work with the General Contractor and all other trades. Coordinate with the General Contractor, any openings which they are to provide before submitting a bid proposal in order to avoid conflict and disagreement during construction. Improperly located openings shall be reworked at the expense of the Contractor.

1.3 The Contractor shall plan their work ahead and shall place sleeves, frames or forms through all walls, floors and ceilings during the initial construction, where it is necessary for piping, ductwork, conduit, etc., to route through; however, when this is not coordinated, the Contractor shall then do all cutting and patching required for the installation of their work, or pay other trades for doing this work when so directed by the Engineer. Any damage caused to the building by this Contractor shall be corrected or rectified at their expense.

1.4 The Contractor shall notify other trades in due time where they will require openings or chases in new concrete, masonry, etc. Set all concrete inserts and sleeves for their work. Failing to coordinate, Contractor shall cut openings for the work and patch same as required at their expense with qualified tradesman.

1.5 The Contractor shall be responsible for properly shoring, bracing, supporting, etc., any existing and/or new construction to guard against cracking, settling, collapsing, displacing, or weakening while openings are being made. Any damage occurring to the existing and/or new structures, due to failure to exercise proper precautions or due to action of the elements shall be promptly and properly corrected to the satisfaction of the Engineer.

1.6 All work improperly performed or not performed as required in this section, shall be corrected by the General Contractor at the responsible Contractor’s expense.

PART 2 – SLEEVES:

2.1 Cast iron or Schedule 40 steel sleeves shall be installed through all walls where pipe enters the building below grade. Sleeves shall be flush with each face of the wall and shall be sufficiently larger than the entering pipe to permit thorough caulking between pipe and sleeve for water proofing. Horizontal sleeves passing through exterior walls or where there is a possibility of water leakage and damage shall be caulked watertight. Utilize “Link-Seal” at these locations.

2.2 In all cases, sleeves shall be at least two pipe sizes larger than nominal pipe diameter plus insulation. Sleeves through walls and floors shall be cut off flush with inside surface unless otherwise indicated.

2.3 Vertical sleeves in roofs shall be flashed and counterflashed with lead (4 lb.) or 16 oz. copper and welded or soldered to piping, lapped over sleeve and properly weather sealed. Where sleeves pass through roof construction, sleeves shall extend minimum of 12" above the roof.

2.4 Cast iron or Schedule 40 steel sleeves shall be installed through all walls where pipe enters the building below grade. Sleeves shall be flush with each face of the wall and shall be sufficiently larger than the entering pipe to permit thorough caulking between pipe and sleeve for water

proofing. Horizontal sleeves passing through exterior walls or where there is a possibility of water leakage and damage shall be caulked watertight. Utilize “Link-Seal” at these locations.

2.5 Provide pipe sleeves through all interior wall penetrations. Sleeve shall be cast iron or schedule 40 steel. In all cases, sleeves shall be at least two pipe sizes larger than nominal pipe diameter plus insulation. Sleeves through walls and floors shall be cut off flush with inside surface unless otherwise indicated. Reference Part 5 for firestopping requirements in rated walls. Sleeves and annular space between pipe and sleeve in non-rated walls shall be sealed completely with acoustical non-shrink caulk.

2.6 Vertical sleeves in roofs shall be flashed and counterflashed with lead (4 lb.) or 16 oz. copper and welded or soldered to piping, lapped over sleeve and properly weather sealed. Where sleeves pass through roof construction, sleeves shall extend minimum of 12" above the roof.

PART 3 – CUTTING:

3.1 All openings in plaster, gypsum board or similar materials, shall be framed by means of plaster frames, casing beads, or angle members as required. The intent of this requirement is to provide smooth, even termination of wall, floor, and ceiling finishes as well as to provide a fastening means for devices, etc.

3.2 The Mechanical Contractor shall coordinate all openings in masonry walls with the General Contractor; and, unless otherwise indicated in the Contract Documents, shall provide lintels for all openings required for the mechanical work such as louvers, exhaust fans, etc. Prime paint all lintels. Lintels shall be sized as follows: Unless noted otherwise in the Structural Drawings.

3.2.1 New Openings under 48" in width: Provide one 3½"x3½"x3/8" steel angle for each 4" of masonry width. Lintel shall have 8" bearing on each end.

3.2.2 New Openings over 48" in width: Consult with Structural Engineer.

3.3 No cutting shall be performed at location that will weaken the structure and unnecessary cutting must be avoided. If in doubt, contact the Engineer.

3.4 Pipe openings in slabs and walls shall be cut with core drill. Hammer devices will not be permitted. Edges of trenches and large openings shall be scribe-cut with a masonry saw.

PART 4 – PATCHING, REPAIRING AND FINISHING:

4.1 Patching and repairing made necessary by work performed under this Division shall be included as a part of the work and shall be done by skilled workers of the trade. The work shall be performed in strict accordance with the provisions herein before specified to match adjacent surfaces and in a manner acceptable to the Engineer.

4.2 Where portions of existing sites, lawns, shrubs, paving, etc. are disturbed for installation of work of this Division, such items shall be repaired and/or replaced back to original or better condition to the satisfaction of the Engineer.

4.3 Piping and ductwork passing through floors, ceilings and walls in finished areas shall be fitted with chrome plated brass escutcheon trim pieces of sufficient outside diameter to amply cover the sleeved openings and an inside diameter to closely fit the pipe/duct around which it is installed.

4.4 Flanged metal collars shall be provided around all ducts, flues, pipes, etc. at all wall penetrations, both sides. Penetrations through any wall will require the installation of flanged collars. Openings shall not be any larger than 2” in any direction than the piping/duct passing through the wall. Openings larger than this requirement shall also be infilled to match adjacent construction.

Fill void with insulation for sound reduction.

PART 5 – FIRESTOPPING:

5.1 Provide shop drawings indicating penetration detail for each type of wall and floor construction. Shop drawings must be specific for each individual type of penetration (one hour fire rated gypsum wall board with insulated metal pipe penetration, etc.) Provide copies to the authority having jurisdiction if required.

5.2 All mechanical pipes and ducts penetrating fire rated floors and walls shall be firestopped by this Contractor. All firestopping products and assemblies installed shall be UL listed.

5.3 Where the installation of conduit, ducts, piping, etc. requires the penetration of fire or smoke rated walls, ceilings or floors, the space around such conduit, duct, pipe, etc., shall be tightly filled with an approved non-combustible fire insulating material and properly sealed to maintain the rating integrity of the wall, floor or ceilings affected.

5.4 Where the installation of ductwork requires the penetration of non-rated floors, the space around the duct or pipe shall be tightly filled with an approved non-combustible material.

5.5 The manufacturer of the firestopping materials shall provide onsite training for the installing Contractor. The training session shall demonstrate to the Contractor the proper installation techniques for all the firestopping materials.

5.6 Firestopping materials include (but are not limited to) wraps, strips, caulks, moldable putties, restricting collars with steel hose clamps, damming materials, composite sheets, fire dam caulks, steel sleeves, etc.

5.7 The following indicates the 3M penetration details for uninsulated pipe penetration of various wall and floor construction types (the list is not inclusive):

- One, two or three hour fire rated concrete floor - 3M #5300-MPC8.
- One, two or three hour fire rated solid or block concrete wall - 3M #5300-MPC16 or 3M #5300-MPC26.
- One hour fire rated gypsum wallboard - 3M #5300-MPC7.
- Two hour fire rated gypsum wallboard - 3M #5300-MPC7.

5.8 The following indicates the 3M penetration details for insulated pipe penetrations of various wall and floor construction types (the list is not inclusive):

- One, two and three hour fire rated concrete floor - 3M #5300-IMP2.
- One, two and three hour concrete block wall - 3M #5300-IMP2.
- One hour fire rated gypsum wallboard - 3M #5300-IMP4.
- Two hour fire rated gypsum wallboard - 3M #IMP7.

5.9 HVAC ducts penetrating a one or two hour fire rated wall or floor shall be firestopped per 3M #5300-HVD1.

5.10 Multiple pipes penetrating fire rated floors and walls may be firestopped as a group. Submit details for specific applications if this method of firestopping is chosen.

END OF SECTION 201100

SECTION 201200 - EXCAVATION, TRENCHING, BACKFILLING AND GRADING

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 The Contractor shall include all excavating, filling, grading, and related items required to complete their work as shown on the drawings and specified herein or as required to complete, connect, and place all mechanical systems in satisfactory operation.

PART 2 – EARTHWORK CLASSIFICATION:

2.1 Without regard to the materials encountered, all excavation and materials excavated shall be unclassified. Materials to be excavated shall include earth, rock, concrete, or any other obstructions encountered in excavation and/or trenching to install underground utility pipes, tanks, vaults, or other equipment.

2.2 Include all costs for rock removal, including mass rock and trench rock in the bids. No adjustment in the contract sum will be made on account of the presence or absence of rock, shale, debris, obstructions, or other materials encountered in the excavating. The Contractor shall be responsible for the removal of all materials encountered as required for the installation of the work.

2.3 It shall be distinctly understood that references to rock, earth, topsoil or any other excavated or non-excavated material or other material on the construction plans, cross section, contract documents, technical specification, or provisions, whether in numbers, words, letters, lines or graphically shown, is solely for information for the Engineer and Owner. This information shall not be taken as an indication of the classification of the material to be excavated, bored, or removed by any method, including drilling, and blasting, or materials not removed. This information shall not be taken as to the quantity of either rock, earth, topsoil, or any other material involved, or the quality of the material such as hardness, wetness, workability, or suitability of the material either during excavation and construction or as a material to be reused during construction.

2.4 The Contractor shall draw their own conclusions as to the surface and sub-surface conditions to be encountered during construction of this project. The Engineer and Owner do not give any guarantee or warranty as to the accuracy of the data shown and no claim will be considered for additional compensation when the materials encountered are not in accord with the information shown.

2.5 Refer to Specification Division EARTHWORK located in the Site Work portions of the Specifications and Civil Drawings for additional information. Also refer to the GEOTECHNICAL report (provided for informational purposes only) included in the Front End of the Specifications.

PART 3 – EXCAVATION:

3.1 Unless otherwise shown or required, provide separate trenches for sewers, water lines and other underground raceways, with a minimum of 10 feet measured from outside diameter between pipes. In locations, such as close to buildings where separate trenches for sewers and water lines are impractical, lay the water pipe on a solid shelf at least 2'-0" above the top of the sewer and 2’-0" to the side.

3.2 Water lines crossing under sewer lines, or crossing less than 2 feet above sewer lines, must be concrete encased for a distance not less than 5 feet on either side of the point of crossover.

3.3 Excavate trenches of sufficient width for proper installation of the work. Excavate to 6" below the bottom of new pipes for installation of compacted fill.

3.4 Sheet and brace trenches as necessary to protect workers and adjacent structures. Comply with local regulations or, in the absence thereof, with the latest version of "Manual of Accident Prevention in Construction" by the Associated General Contractors of America and current OSHA Standards. Do not remove sheeting until trench is backfilled sufficiently to protect pipe and/or equipment and prevent injurious caving. Where removal of sheeting and/or bracing is hazardous, leave in place. Cut off such sheeting not to be removed at least 3 feet below finished grade.

3.5 Rules and regulations governing the respective utilities shall be observed in executing all work under this Division. Active utilities discovered in the course of excavation shall be protected or relocated in accordance with written instructions from the Engineer. Inactive and abandoned utilities encountered in trenching operations shall be removed and abandoned with ends plugged or capped in accord with current codes and safe practice. If in doubt, contact Engineer.

3.6 Machine excavation shall not be allowed within ten (10) feet of electric lines, natural gas lines or other lines carrying combustible materials. Use only hand tool excavation methods.

3.7 The removal of rock shall be accomplished by use of hand or power tools only. Blasting shall not be permitted. Any damage to existing structures, piping services, or rock intended for bearing, shall be corrected at the responsible Contractor's expense.

3.8 Perform final grading of trench bottoms by hand tools; carry machine excavation only to such depth that soil bearing for pipes and raceways will not be disturbed. Grade the bottom of trenches evenly to ensure uniform bearing for all piping and raceways. Cut bell holes as necessary for joints and jointmaking. Except as hereinafter specified, bottom of trenches for bell and spigot pipe, flanged pipe, etc. shall be shaped to the lower quadrant of pipe with additional excavation for bell or flange. Piping installed where it rests on bell or flange and/or is supported with blocks or wedges will not be accepted.

3.9 Keep trenches free from water while construction is in progress. Under no circumstances lay pipe or appurtenances in water. Pump or bail water from bell holes to permit proper joining of pipe. Any dewatering from this Contractor's trenches which is required during construction, shall be included in this Contract.

3.10 In no case shall excavation work be accomplished that will damage in any way the new structure, existing structures, equipment, utility lines, landscaping to remain, etc. The Contractor shall take the necessary steps to prevent flow of eroded earth by water or landslide onto the property of others, or against the structures. The repair of all such damage or any other damage incurred in the course of excavation shall be at the responsible Contractor’s expense.

3.11 Use surveyor's level to establish elevations and grades.

3.12 Machine excavation shall be held a sufficient distance from foundations and footings to ensure no damage to same. Contractor shall accept full responsibility and pay for repairs and/or replacement of structural members, footings, etc.

3.13 The Contractor shall accept the site as it is. Remove all trash, rubbish, and unsuitable material from the site at the completion of excavation work.

3.14 The Contractor shall provide and maintain barricades, trench plates and temporary bridges around excavations as required for safety. Temporary plates or bridges shall be provided where excavations cross paved areas and walks. The Contractor shall maintain these plates and bridges in a safe and passable condition for all traffic until removal. Refer to OSHA Standards for such installations and comply with same in all details.

3.15 Pay particular attention to existing utilities and lines to avoid damage. The locations of existing lines which are indicated on the plans were taken unconfirmed from drawings prepared for previous construction and locations are approximate only. Also, certain water, gas, electric, storm and sanitary sewer lines and other underground appurtenances, active or abandoned, may not appear on the drawings. It shall be each Contractor's responsibility to ascertain the location of all lines and excavate with caution in their area.

3.16 Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor’s expense.

3.17 Maintain carefully all benchmarks, monuments and other reference points. If disturbed or destroyed, replace as directed.

PART 4 – BACKFILL, COMPACTION AND SURFACE REPAIR:

4.1 Backfilling for Mechanical Work shall include all trenches, manhole pits, tanks and/or any other earth and/or rock openings which are excavated under this Contract. Backfilling shall be carefully performed, and the surface restored to its original level to receive new finish. Wherever trenches and earth openings have not been properly filled and/or settlement occurs, they shall be re-excavated, re-filled and properly compacted, smoothed off and finally made to conform to the level of the original ground surface.

4.2 All trenches shall be backfilled with a bedding of 6" of manufactured sand or #8 crushed stone after finished excavation. Install the new pipe on the compacted fill material. Install tracer wire on all pipe. Apply any special coatings to the pipe. Also perform all required pressure tests and check the grade of the pipe to ensure that it is correct and free of swags, bows or bends. Once coatings and testing are complete, backfill the pipe bed to 12" above the top of the pipe with specified compacted fill material. Backfill the remainder of the trench with earth (rock and debris free) tamped at 6" intervals. Water settling of backfill is permitted only as an aid to mechanical compacting.

4.3 Backfill and compact beneath areas to be seeded or sodded within six (6) inches of finished grade. The remaining six (6) inches shall be backfilled with clean topsoil.

4.4 Backfill and compact beneath concrete slabs, paved areas, walks, etc. shall be brought to proper grade to receive the sub-base, concrete slab, or paving. No concrete or paving shall be placed on uncompacted fill or unstable soil.

4.5 Wherever, in the opinion of the Engineer, the soil at or below the requisite pipe grade is unsuitable for supporting piping, special support shall be provided as directed by the Engineer.

4.6 Backfill and compaction for natural gas lines shall be in strict accordance with the local utility company or local municipality’s requirements. If in doubt, contact the utility company or local municipality.

4.7 Unsuitable material and surplus excavated material not required for backfill shall be removed from the site. The location of dump and length of haul shall be the affected Contractor's responsibility.

4.8 Provide and place any additional fill material from off the site as may be required for backfill. Fill obtained from off site shall be of kind and quality as specified for backfill and the source approved by the Engineer and shall be brought to the site by the Contractor requiring the fill.

4.9 If not specified or indicated elsewhere in the Contract Documents to be performed by Others, the Contractor shall lay new sod over their excavation work for existing disturbed grassy areas. Level, with adjacent surface, compact and water in accord with sound sodding practice.

4.10 Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated in the following two paragraphs.

4.11 At a minimum, fill in grass areas shall be compacted to 90% Standard Proctor Density, ASTM D-698, at moisture content between 2 percent below to a 3 percent above the optimum moisture content or as specified in Specification Division EARTHWORK; whichever is most stringent.

4.12 At a minimum, fill in concrete or asphalt area shall compact to 98% Standard Proctor Density, ASTM D-698, at moisture content between 2 percent below to a 3 percent above the optimum moisture content or as specified in Specification Division EARTHWORK; whichever is most stringent.

4.13 Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

4.14 All materials used for backfill around structures shall be of a quality acceptable to the Engineer and shall be free from large or frozen lumps, large rocks, wood, and other extraneous material. All spaces excavated and not occupied by footings, foundations, walls, or other permanent work shall be refilled with earth up to the surface of the surrounding ground, unless otherwise specified, with sufficient allowance for settlement.

4.15 In making the fills and terraces around the structures, the fill shall be placed in layers not exceeding 8 inches in depth and shall be kept smooth as the work progresses. Each layer of the fill shall be compacted. Sections of the fill immediately adjacent to buildings or structures shall be thoroughly compacted by means of mechanical tamping or hand tamping as may be required by the conditions encountered. All fills shall be placed to load structure symmetrically.

4.16 Rough grading shall be held below finished grade and then the topsoil which has been stockpiled shall be evenly spread over the surface. The grading shall be brought to the levels as specified. Final dressing shall be accomplished by hand work or machine work, or a combination of these methods as may be necessary to produce a uniform and smooth finish to all parts of the regrade. The surface shall be free from clods greater than one inch in diameter. Excavated rock (1” and smaller) may be placed in the fills, but is shall be thoroughly covered. Rock placed in fills shall not be closer than 24 inches from finished grade. Refer to Specification Division EARTHWORK.

4.17 Maintenance Settling: Where settling is measurable or observable at excavated areas during Project Warranty Period, remove surface (pavement, concrete or any other surface or finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work and eliminate evidence of restoration.

4.18 Disposal of Excess Non-organic Soil and Rock: Any excess excavated waste material shall become the property of the Contractor and shall be disposed of by the Contractor off site at no additional cost to the Owner.

4.19 Unless otherwise directed by the Owner during construction, excess topsoil and subsoil suitable for fill shall be disposed of by the Contractor off site at no additional cost to the Owner.

PART 5 – MINIMUM DEPTHS OF BURY TO TOP OF PIPE:

5.1 In the absence of other indication, the following shall be the minimum depth of bury to top of pipe of exterior utility lines. Check drawings for variations.

5.1.1	Domestic Water Lines	36 inches below final grade.
5.1.2	Fire Service Lines	48 inches below final grade.
5.1.3	Storm Lines	24 inches below final grade.
5.1.4	Sanitary Lines	36 inches below final grade.
5.1.5	Natural Gas Lines	36 inches below final grade.
5.1.6	All Other Lines Not Listed	36 inches below final grade.

END OF SECTION 201200

SECTION 201300 - PIPE, PIPE FITTINGS AND PIPE SUPPORT

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, General Conditions-Mechanical and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 The piping indicated shall be installed complete and shall be of the size indicated. When a pipe size is not indicated, the Contractor shall request the pipe size from the Engineers. All piping shall be installed straight and true, parallel, or perpendicular to the building construction. Piping shall be installed so as to allow for expansion without damage to the building finishes, structure, pipe, equipment, etc., use offsets, U-bends or expansion joints as required. Where a section of piping is not indicated but is obviously required for completion of the system, the Contractor shall provide same at no additional cost to the project. No mitered joints or field fabricated pipe bends shall be accepted. Pipe shall clear all windows, doors, louvers, and other building openings.

1.3 All pipe shall be supported in a neat and workmanlike manner and wherever possible, parallel runs of horizontal piping shall be grouped together on trapeze type hangers. Vertical risers shall be supported at each floor line with approved steel pipe riser clamps. The use of wire or perforated metal to support pipes will not be permitted. Hanging pipes from other pipes shall not be permitted. Spacing of copper/steel pipe supports shall not exceed eight feet for pipes up to 1¼ inches and ten feet on all other piping. Spacing of CPVC piping shall not exceed five feet for up to 1-1/2” pipe and seven feet for pipes 2” and greater. Small vertical pipes (1 inch and less) shall be bracketed to walls, structural members, etc. at four (4) foot intervals so as to prevent vibration or damage by occupants. Insulated piping shall be supported on a rigid insulation block at each hanger so as to prevent crushing of insulation by hangers. Hangers shall pass completely around the insulation jacket and a steel protective saddle shall be applied to prevent compression of the insulation. (Refer to Specifications Section entitled INSULATION-MECHANICAL.

1.4 Where piping rests directly on a hanger, clip, bracket or other means of support, the support element shall be of the same material as the pipe, (e.g., copper to copper, ferrous to ferrous, etc.) or shall be electrically isolated one from the other so as to prevent pipe damage by electrolysis. Pay particular attention and do not allow copper pipe to rest on ferrous structural members, equipment, etc. without electrolytic isolation.

1.5 Where plastic piping penetrates a fire rated assembly, it shall be replaced with a threaded metal adapter and metal pipe or whatever means necessary to maintain the separation rating in accordance with local plumbing and fire codes.

1.6 Plastic piping or any material with a flame and smoke spread rating not approved for plenum use shall not be permitted in supply, return, relief, or exhaust plenums.

1.7 Install all gas piping per NFPA54. Union or valves shall not be installed in an air plenum. Piping below slab must be sleeved and vented. Piping installed in contained non-vented areas shall not have mechanical joints.

1.8 Dielectric unions shall be provided at all connections of dissimilar materials.

1.9 In general, piping shall be installed concealed except in Mechanical, Janitor Rooms, etc. unless otherwise indicated, and shall be installed underground or beneath concrete slabs only where indicated. All lines at ceilings shall be held as high as possible and shall run so as to avoid conflicts with other trades, and to facilitate the Owner's use and maintenance. Location of pipe in interior partitions shall be carefully coordinated with whoever will construct the partitions after the piping is in place. Where exposed risers occur, they shall be kept as close to walls as possible.

1.10 Unless otherwise indicated, all materials shall be new and of the best grade and quality for the type specified.

1.11 Installation of pipe shall be in such a manner as to provide complete drainage of the system toward the source. Drain valves shall be provided at all drainage points on pipes. Drain valves shall be ½" size gate type with 3/4" hose thread end and vacuum breaker. Label each drain valve.

1.12 Pipe shall be cut accurately to measurements established at the building by the Contractor and worked into place without springing or forcing. All pipe shall be reamed to full pipe diameter before joining and before assembling. All lengths of pipe shall be set vertically and tapped with a hammer to remove scale and dust and inspected to ensure that no foreign matter is lodged therein.

1.13 All hot and cold water piping shall be kept a sufficient distance apart so as to prevent heat transfer between them. Cold water piping shall also be kept apart from refrigerant hot gas lines.

1.14 Piping carrying water or other fluids subject to freezing shall not be installed in locations subject to freezing; if in doubt, consult Engineer.

1.15 Piping for all drainage systems shall be installed to permit flow, trapping, and venting in accord with current codes and sound practice.

1.16 All increases in vent size at roof shall be by means of service weight cast iron increasers.

1.17 Non-metallic piping shall be installed in strict accordance with the manufacturer's instructions. If no such instructions are available, consult Engineers.

1.18 Nipples shall be of the same material, composition, and weight classification as pipe with which installed.

1.19 Where piping is not indicated on the plans, but is obviously or apparently required, contact the Engineers prior to submission of a bid proposal.

1.20 Pay particular attention to conflict of piping with other work. Do not install until conflict is resolved. If necessary, contact Engineers.

1.21 Piping materials in each system shall, to the extent practicable, be of the same material. Frequent changes of material (for example, from copper to steel) shall be avoided and in no case shall be accomplished without use of insulating unions and permission of the Engineers.

1.22 Apply approved pipe dope (for service intended) to all male threaded joints. Pay particular attention to dope for fuel gas lines. The dope shall be listed for such use.

1.23 Eccentric reducers shall be used where required to permit proper drainage and venting of pipe lines; bushings shall not be permitted.

1.24 High points of closed loop geothermal and hot water and heat pump systems shall have manual air vents as required unless automatic air vents are specifically indicated. Pipe to suitable drainage point.

1.25 All piping shall be capped or plugged during erection as required to keep clean and debris and moisture free.

1.26 The entire domestic hot, cold, and recirculating hot water piping system shall be sterilized in strict accord with requirements of the Department of Health Codes, Rules and Regulations for the State which the work is being accomplished in.

1.27 Refrigerant piping must be installed to meet the HVAC equipment manufacturer's requirements. A refrigerant piping schematic shall be obtained from the equipment manufacturer which indicates pipe sizes, valves, traps, sight glasses and other required refrigerant specialties. While installing or soldering refrigerant lines, the piping system must be continuously purged with nitrogen. After the piping system is installed, the refrigerant system must be evacuated to 25 microns for eight hours. Contact engineer 72 hours prior to installation of refrigerant lines or evacuation of refrigerant system.

1.28 Transition appropriately from PVC piping to bronze or cast iron piping. When these valves are flanged type, utilize PVC flanges with proper gaskets. Utilize bronze transition unions for threaded pipes. Do not thread PVC piping directly to any bronze valve.

PART 2 - UNIONS AND FLANGES AND WELDED TEES:

2.1 Screwed unions, soldered unions or bolted flanges shall be provided as required to permit removal of equipment, valves, and piping accessories from the piping system. Keep adequate clearances for coil removal, rodding, tube replacement, motor lubrication, filter replacement, etc. Flanged joints shall be assembled with appropriate flanges, gaskets, and bolting. The clearance between flange faces shall be such that the connections can be gasketed and bolted tight without imposing undue strain on the piping system.

2.2 Dielectric insulating unions or couplings shall be used wherever the adjoining materials being connected are of dissimilar metals such as connections between copper and steel pipe.

2.3 Tee connections for welded pipe shall be made up with welding fittings. Where the size of the side outlet is such that a different connection technique than on the run is required, a weldolet, sockolet, or threadolet type fitting may be used for the branch in place of reducing tees only where the branch is 2/3 the run size or smaller.

PART 3 - SPECIFICATIONS STANDARDS:

3.1 All piping and material shall be new, made in the United States and shall conform to the following minimum applicable standards:

3.1.1 Steel pipe; ASTM A-120.

3.1.2 Copper tube; Type K, L, M; ASTM B88-62; Type DWV ASTM B306-62.

3.1.3 Cast iron soil pipe; ASA A-40.l and CS 188-59.

3.1.4 Cast iron drainage fittings; ASA B16.12.

3.1.5 Cast iron screwed fittings; ASA B16.4.

3.1.6 Welding fittings; ASA B16.9.

3.1.7 Cast brass and wrought copper fittings; ASA B16.18.

3.1.8 Cast brass drainage fittings; ASA B16.23.

3.1.9 Reinforced concrete pipe; ASTM-C-76-64T.

3.1.10 Solder; Handy and Harmon, United Wire and Supply; Air Reduction Co. or equivalent.

PART 4 - PITCH OF PIPING:

4.1 All piping systems shall be installed so as to drain to a low point. Certain minimum pitches shall be required for this drainage. For proper flow and/or for proper operation, the following pitches shall be required:

4.2 Interior Soil, Waste and Vent Piping: ¼ inch per foot in direction of flow where possible but in no case less than 1/8" per foot.

4.3 Exterior Sanitary Lines: Not less than one (1) percent fall in direction of flow and no greater than indicated.

4.4 Roof Leaders: 1/8 inch per foot where possible. Where not possible, run dead level.

4.5 Condensate Drain Lines From Cooling Equipment: Not less than ¼ inch per foot in direction of flow.

4.6 All Other Lines: Provide ample pitch to a low point to allow 100 percent drainage of the system.

PART 5 – APPLICATIONS:

5.1 Soil, Waste and Vent Piping (Below Slab)

5.1.1 Schedule 40 PVC pipe with drainage pattern fittings and solvent cement joints made in accordance with the Kentucky Plumbing Code.

5.2 Soil, Waste and Vent Piping (Above Slab)

5.2.1 Schedule 40 PVC pipe with drainage pattern fittings and solvent cement joints made in accordance with the Kentucky Plumbing code.

5.3 Domestic Hot, Cold and Recirculating Water Piping (Above Slab)

5.3.1 Type "L" hard copper tubing with wrought copper fittings with lead free solder equivalent in performance to 95/5. (Maximum lead content of solder and flux is 2%).

5.3.2 “Pex” Domestic Water Piping:

5.3.2.1 “Pex” piping may be utilized for pipe runouts to individual plumbing fixtures. “Pex” may not be utilized for piping serving multiple fixtures.

5.3.2.2 Manufactured by Zurn PEX, Inc. and conforms to ASTM F877 cross-linked polyethylene (PEX) tubing hot and cold water distribution systems, ASTM F876 cross-linked polyethylene (PEX) tube, ASTM F1807 fittings and ASTM F2159 fittings. Comply with manufacture’s product data, including product technical bulletins, technical memo’s, installation instructions and design drawings, including; Zurn PEX Plumbing Installation Guide. Store PEX tubing indoors, in cartons or under cover to avoid dirt or foreign material from entering the tubing. Do not expose PEX tubing to direct sunlight for more than six months. If construction delays are encountered, cover the tubing that is exposed to direct sunlight.

5.3.2.3 Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity and possesses the skills and knowledge to install a PEX potable water distribution system. Installer will utilize skilled workers holding a trade qualification license or equivalent or apprentices under the supervision of a licensed tradesperson.

5.3.2.4 Tubing: Cross-linked polyethylene (PEX) manufactured by the Silane method. Non-barrier type shall have a pressure and temperature rating of 160 PSI at 73°F, 100 PSI at 180°F and 80 PSI at 200°F.

5.3.2.5 Fittings: Fittings shall be manufactured by Zurn PEX Inc, identified by the letter’s “Q” or “Z”. Manufactured in accordance with ASTM F1807 or ASTM F2159 and/or comply with ASTM F877 system standard as identified on the fitting.

5.3.2.6 Crimp Systems: Qickclamp: Listed to ASTM F877, identified as a Zurn PEX Inc, Qickclamp by the “Qickclamp” and “Q” marking. Copper Crimp Ring: Listed to ASTM F1807 and/or ASTM F877, black in color and identified as a Zurn PEX Inc, ring by the letter “Q”.

5.3.2.7 Tools: Qickclamp tools shall be supplied by the PEX tubing manufacturer, identified by the name “Zurn” on the tool. Copper Crimp Ring tools shall be supplied by the PEX tubing manufacturer or approved by the PEX tubing manufacturer for use.

5.3.2.8 Valves Shall be of the plastic or metal type, meeting the requirements of ASTM F877, identified as such with the appropriate mark on the product

5.4 DOMESTIC COLD, HOT AND RECIRCULATING HOT WATER PIPING (BELOW SLAB): Type "K" hard or soft copper tubing with wrought copper fittings and brazed joints. There shall be no joints beneath slabs.

5.5 Geothermal Piping

5.5.1 Polyethylene pipe manufactured by Driscoplex “5300 Climate Guard” or Vanguard Polyethylene “Geo-Black”. Piping shall be listed for closed-loop ground source geothermal application.

5.5.2 The pipe and fittings of the system shall be warranted by the manufacturer for ground source heat pump service.

5.5.3 Specifications for the polyethylene pipe and fittings:

5.5.3.1 All pipe and heat fused materials shall be manufactured from a virgin polyethylene extrusion compound material in accordance with ASTM D-3350, Sections 4.1 and 4.2. Pipe shall be manufactured to outside diameters, wall thickness, and respective tolerances as specified in ASTM D-3035 or D-2447. Fittings shall be manufactured to diameters, wall thicknesses, and respective tolerances as specified in ASTM D-2683 for socket fittings and ASTM F-1055 for electrofusion fittings.

5.5.4 The material shall maintain a 1600 psi hydrostatic design basis at 73.4 degrees F per ASTM D-2837 and shall be listed in PPI TR4 as a PE4710 piping formulation. The material shall be high density, polyethylene extrusion compound having a cell classification of PE445574C as specified in ASTM D-3350 with the following exception: this material shall exhibit zero failures (F0) when tested for 192 or more hours under ASTM D-1693, condition C, as required in ASTM D-3350.

5.4.5 Dimensions

5.4.5.1 Pipe with a diameter of ¾”, 1” and 1¼” (nominal sizes) shall be manufactured in accordance with ASTM D-3035 with a dimension ratio of 11.

5.4.5.2 Pipe with diameter of 1½” and 2” (nominal sizes) shall be manufactured in accordance with ASTM D-3035 with a minimum dimension ratio of 15.5 (or Schedule 40).

5.4.5.3 Pipe 3" (nominal) and larger shall be manufactured in accordance with ASTM D-3035 with a minimum dimension ratio of 17.

5.4.6 Runouts to Heat Pumps 2" and Smaller: Type "L" hard copper tubing with wrought copper fittings and 95/5 solder.

5.4.7 Runouts to Heat Pumps 2½" and Larger: Type "L" hard copper piping with wrought copper fittings and 95/5 solder may be installed.

5.4.8 Warranty

5.4.8.1 Manufacturer shall supply a written warranty of 25 years or greater, specifying material replacement and labor allowance.

5.4.9 Certification

5.4.9.1 Manufacturer shall supply a notarized document confirming compliance with the above standards.

5.4.10 Pipe Joining Methods:

5.4.10.1 The ~~only~~ acceptable method for joining buried pipe systems is by a heat fusion process.

5.4.10.2 ~~As a bid alternate,~~ Victaulic HDPE piping system may be used in lieu of heat fusion joints. Contractor shall utilize Victaulic Style 905 HDPE Stab Couplings, 2" – 12" in conjunction with Style 907 Transition Couplings. Couplings shall be provided with pre-lubricated gasket for and rated for working pressures exceeding to the adjoining HDPE pipe.

5.5.5 When PVC pipe is connected to steel or copper piping, a brass threaded male/female connection shall be used to transition materials. Provide appropriate dielectric union to a black steel pipe where applicable. This shall be a manufactured fitting. No metal threads shall be inserted into PVC piping or PVC threads into metal piping.

5.6 Air Vent Discharge Lines

5.6.1 Type "L" soft copper; wrought copper fittings, 95/5 solder.

5.7 Condensate Drain Lines

5.7.1 Type "M" copper tubing with sweat fittings and 95/5 solder.

5.8 Water Heater Relief Line

5.8.1 Type "M" copper tubing with sweat fittings and 95/5 solder.

5.9 Dual Temperature Hot/Chilled Water Heating Piping

5.9.1 2" and Smaller: Schedule 40 black steel pipe with screwed fittings or Type "L" hard copper tubing with wrought copper fittings and 95/5 solder.

5.9.2 2½" and Larger: Schedule 40 black steel pipe with 125# welded or flanged joints. Weldolets may be used for branch line connections to pipe mains. Type "L" hard copper piping with wrought copper fittings and 95/5 solder may be installed.

5.9.3 Schedule 40 black steel mechanical grooved pipe couplings and fittings with 125# rating manufactured by Victaulic or equal. Install gaskets as recommended by the manufacturer. Piping system shall be rated for minimum of 220 degrees F water temperature. Mechanical grooved piping may not be used if system water temperature exceeds 220ºF.

PART 6 – EXTERIOR APPLICATIONS (SITE WORK):

6.1 SITE SANITARY SEWER: Refer to the Civil Plans and Specifications.

6.2 SITE STORM SEWER: Refer to the Civil Plans and Specifications.

6.3 SITE WATER: Refer to the Civil Plans and Specifications.

6.4 SITE FIRE PROTECTION: Refer to the Civil Plans and Specifications.

6.5 SITE NATURAL GAS: Refer to the Civil Plans and Specifications.

6.6 SITE GREASE INTERCEPTOR PIPE:

6.7 SITE FIRE PROTECTION: - Refer to the Specification Section – FIRE PROTECTION.

6.7.1 Service weight cast iron piping with bell and spigot fittings complying with ASTM A 74. All joints shall be compression gasket type.

PART 7 – PLUMBING PIPING APPLICATIONS:

7.1 SOIL, WASTE AND VENT PIPING (BELOW SLAB):

7.1.1 Service weight cast iron hub and spigot piping with compression gasket joints for all Main Mechanical Rm piping, Kitchen, and Grease Interceptor piping.

7.1.2 Schedule 40 PVC pipe with drainage pattern fittings and solvent cement joints made in accordance with the Plumbing Code. PVC pipe shall not be installed where waste water applications exceed 140 deg F.

7.1.3 Piping below slab shall be a minimum of 2” in size.

7.2 SOIL, WASTE AND VENT PIPING (ABOVE SLAB):

7.2.1 Service weight hubless cast iron pipe with manufacturer's approved bands.

7.2.2 Service weight cast iron hub and spigot piping with compression gasket joints.

7.2.3 Schedule 40 galvanized steel piping with screwed ends and cast iron drainage pattern fittings for piping 2" and less in size. Provide pipe adapters for connector of cast iron pipe at slab.

7.2.4 Type DWV copper drainage piping with cast bronze drainage pattern fittings with solder joints.

7.2.5 Schedule 40 PVC pipe with drainage pattern fittings and solvent cement joints made in accordance with the Plumbing Code.

7.3 ROOF LEADERS AND STORM LINES (BELOW SLAB):

7.3.1 Service weight cast iron hub and spigot piping with compression gasket joints.

7.3.2 Schedule 40 PVC pipe with drainage pattern fittings and solvent cement joints made in accordance with the Plumbing Code.

7.4 ROOF LEADERS AND STORM LINES (ABOVE SLAB):

7.4.1 Service weight hubless cast iron pipe with manufacturer's approved bands.

7.4.2 Service weight cast iron hub and spigot piping with compression gasket joints.

7.4.3 Schedule 40 PVC pipe with drainage pattern fittings and solvent cement joints made in accordance with the Plumbing Code.

7.4.4 Service weight hubless cast iron pipe with manufacturer's approved bands. Horizontal pipe and fittings 4” and larger, shall be suitably braced to prevent horizontal movement. Provide bracing in accordance to CIPI 301-00. Provide “Holdrite” bracing system or approved equal.

7.5 DOMESTIC COLD, HOT AND RECIRCULATING HOT WATER PIPING (ABOVE SLAB):

7.5.1 Type "L" hard copper tubing with wrought copper fittings with lead free solder equivalent in performance to 95/5. (Maximum lead content of solder and flux is 2%).

7.6 DOMESTIC COLD, HOT AND RECIRCULATING HOT WATER PIPING (BELOW SLAB): Type "K" hard or soft copper tubing with wrought copper fittings and brazed joints. There shall be no joints beneath slabs.

7.7 NATURAL GAS PIPING – INTERIOR:

7.7.1 Schedule 40 black steel pipe with wrought steel buttwelded fittings for all piping.

7.7.2 Paint all exterior piping as specified in Section IDENTIFICATIONS, TAGS, CHARTS, ETC.

7.8 WATER HEATER RELIEF LINE: Type "M" copper tubing with sweat fittings and 95/5 solder.

END OF SECTION 201300

SECTION 201310 – PIPE FILLING, CLEANING, FLUSHING, PURGING AND CHEMICAL TREATMENT

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 Review the Specification Section – REQUIRED SHOP DRAWINGS, ETC., and provide all documentations called for therein.

1.3 Through coordination with other Contractors, Vendors and Suppliers associated with this Project, this Contractor shall ensure a complete, 100% functional, tested, inspected, and approved systems. Claims for additional cost or change orders will immediately be rejected.

1.4 Maintain a water treatment program for the closed loop piping systems. It is the Contractor's responsibility to contact the engineer 2 weeks in advance to any treatments performed on the systems. It is the Engineer's discretion whether or not this process should be monitored after notification.

1.5 A pre-installation meeting shall be held with the Owner, Architect, Engineer, General Contractor, Mechanical Contractor, Pipe Fitter Foreman, Geothermal Contractor, and Chemical Treatment Contractor to discuss goals and expectations for cleaning, flushing, purging and chemical treatment.

1.6 Chemicals, equipment, testing services, and chemical application shall be supplied by a single water treatment company for undivided responsibility. The water treatment company shall be a recognized specialist, active in the field of commercial/industrial water treatment for at least 5 years. The water treatment company shall have regional water analysis laboratories, service department, and full time representatives located within the area of the job site or facility.

1.7 Prior to any construction, the Contractor shall sample the existing closed loop chemicals and provide chemical treatment water quality analysis. Provide levels for all items noted in paragraph "Water Quality Minimum Performance Requirements for Closed Loops". Provide a report to the Engineer.

1.8 Be advised the existing loop contains an anti-freeze mixture. Prior to any construction, the Contractor shall sample the existing closed loop and provide anti-freeze mixture data.

1.9 Furnish initial supply of the closed loop chemicals for each system. This contractor shall retest the systems after 3, 6, 9 and 12 months upon substantial completion to verify the proper dosage is in each system. Provide all closed loop chemicals and anti-freeze for the first year. The Contractor shall determine the appropriate chemical volumes for each system. Each system's water shall be tested for proper chemical parameters, clarity, and biological activity. If needed, provide chemical addition, including anti-freeze. Provide any laboratory and technical assistance required to achieve a successful program.

1.10 As a condition of acceptance and project closeout, a summary of water quality and treatment shall be provided in writing to the Owner and/or Engineer after the water treatment services have been successfully completed. The closeout documentation shall include dates for warranty testing.

1.11 Water quality for HVAC systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the

environment. Base HVAC water treatment on quality of water available at Project site, HVAC system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.

1.12 WATER QUALITY MINIMUM PERFORMANCE REQUIREMENTS FOR CLOSED LOOPS:

- Closed hydronic systems shall maintain a pH value within 9 – 10.5 pH for iron and copper piping loops.
- Total Anaerobic Plate Count - Maintain a maximum value of 100 organisms/ml.
- Nitrate Reducers (Denitrifying Bacteria) - Maintain below a maximum value of 10,000 organisms/ml.
- Sulfate Reducers - Maintain below a maximum value of 200 organisms/ml.
- Iron Bacteria - Maintain below a maximum value of 100 organisms/ml.
- Slime Bacteria - Maintain below a maximum value of 1,000 organisms/ml.

PART 2 – CLEANING AND FLUSHING OF HYDRONIC PIPING:

2.1 This project consists of the following Hydronic Piping Loops:

- Tower/Boiler Heat Pump Water

2.2 There are several precautions which must be observed during piping installation. This contractor is advised to read all the manufacturer's instructions prior to commencing the installation. This cleaning and flushing of the systems must be accomplished.

2.3 All water circulating systems for the project shall be thoroughly cleaned before placing in operation to rid the system of dirt, piping compound, mill scale, oil, and all other material foreign to the water. During construction, extreme care shall be exercised to prevent all dirt and other foreign matter from entering the pipe or other parts of the system. Pipe stored on the project shall have the open ends capped and equipment shall have all openings fully protected. Before erection, each piece of pipe, fitting or valve shall be visually examined, and all dirt removed.

2.4 After the piping is complete:

2.4.1 The Contractor shall first fill the piping loops and all runouts with clear water. The loop water shall be circulated for one hour with make-up water open and boiler drain open to accomplish initial flushing of the system.

2.4.2 After initial flushing, all strainers shall be cleaned, and the individual terminal devices and coils shall be connected permanently to the supply and return runouts conditions and then add trisodium phosphate in an aqueous solution to the system at the proportion of one pound per fifty gallons of water in the system.

2.4.3 After the system is filled with this solution, the loop shall be allowed to circulate for 24 hours.

2.4.4 The Chemical Treatment Contractor shall be given notice by the Contractor of scheduling this cleaning and, if the Engineer's representative deems it necessary, the operation shall be repeated.

2.4.5 After the system has been completely cleaned as specified herein, it shall be tested by litmus paper or other dependable method and shall be left on the slightly alkaline side.

2.4.6 If the system is found to be still on the acid side, the cleaning by use of Trisodium Phosphate shall be repeated.

2.4.7 After the cleaning including all strainers and flushing is complete, and approved by CMTA, the Contractor shall provide the proper water treatment for the system.

2.5 After the heat pump loop is complete:

2.5.1 The Contractor shall first close the WSHP isolation valves and open the WSHP bypass valves.

2.5.2 Fill the piping loops and all runouts with clear water. The loop water shall be circulated for one hour with make-up water open and boiler drain open to accomplish initial flushing of the system.

2.5.3 After initial flushing, all strainers shall be cleaned, and the Contractor shall open the WSHP isolation valves and close the WSHP bypass valves and then add trisodium phosphate in an aqueous solution to the system at the proportion of one pound per fifty gallons of water in the system.

2.5.4 After the system is filled with this solution, the loop shall be allowed to circulate for 24 hours.

2.5.5 The Chemical Treatment Contractor shall be given notice by the Contractor of scheduling this cleaning and, if the Engineer's representative deems it necessary, the operation shall be repeated.

2.5.6 After the system has been completely cleaned as specified herein, it shall be tested by litmus paper or other dependable method and shall be left on the slightly alkaline side.

2.5.7 If the system is found to be still on the acid side, the cleaning by use of Trisodium Phosphate shall be repeated.

2.5.8 After the cleaning, including all strainers and flushing is complete, and approved by CMTA, the Contractor shall provide the proper water treatment for the system.

PART 3 – CLOSED LOOP CHEMICAL TREATMENT:

3.1 Provide a 3/4" valved and capped port for injection of the closed loop chemicals into the system.

3.2 After the system is complete it shall be thoroughly cleaned before placing in operation to rid the system of dirt, biological contamination, piping compound, loose mill scale, oil, and all other material foreign to the water as previously specified.

3.3 Before chemical cleaning and sterilization of the entire system, the field and hydronic loop and mains shall be individually flushed and purged until free of dirt, debris, and air. During the flushing/purging and chemical cleaning processes the supply and return run-outs shall be temporarily placed in bypass operation. See SYSTEM FILLING & PURGING PLAN for additional information.

3.4 After chemical cleaning, the entire system shall be sterilized with a biocide added at recommended dosage to effectively kill any present microorganisms. Add glutaraldehyde to achieve 60 – 200 ppm of active ingredient or isothiazoline to achieve 10 – 13 ppm active. Do not flush biocide from system. Corrosion inhibitors shall be installed in closed loop systems containing metal piping, fittings, accessories, etc.

3.5 A bacteria analysis shall be performed to ascertain biological cleanliness of system. If bacteria counts are above set parameters, then sterilization process shall be repeated until bacteria counts are at or below acceptable levels. Microbiological limits are listed under "Water Quality Minimum Performance Requirements" elsewhere in this Specification Section.

3.6 Within 48 hours of the completion of the sterilization and confirmation that bio-levels are within the specified parameters, implement a water treatment program to passivate all metal surfaces.

END OF SECTION 201310

SECTION 202100 - VALVES AND COCKS

PART 1 – GENERAL:

1.1 Each Mechanical Contractor's attention is directed to the General and Special Conditions, General Conditions-Mechanical and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified herein.

1.2 Each Mechanical Contractor (and/or Sub-Contractors) shall provide all valves required to control, maintain, and direct flow of all fluid systems indicated or specified. This shall include but may not be limited to all valves of all types including balancing cocks, air cocks, lubricated plug cocks, packed plug cocks, special valves for special systems, etc., for all Mechanical Systems.

1.3 All valves shall be designed and rated for the service to which they are applied.

1.4 The following type valves shall not be acceptable: Zinc, plastic, fiber or non-metallic.

1.5 Each type of valve shall be of one manufacturer, i.e., gate valves, one manufacturer, globe valves, one manufacturer, silent check valves, one manufacturer, etc. The following valve manufacturers shall be acceptable: Lunkenheimer, Powell, Nibco, Crane, Jenkins, T & S Brass, Walworth, Milwaukee, DeZurik, Consolidated Valve Industries, Inc., Bell & Gossett.

1.6 All valves shall comply with current Federal, State and Local Codes.

1.7 All valves shall be new and of first quality.

1.8 Contractor shall provide colored tape on ceiling tile where valves are located above ceiling. Provide access panels where valves are located above hard ceiling.

PART 2 - TYPES AND APPLICATION - DOMESTIC WATER:

2.1 Ball Valve (for steel or copper piping): Ball valve shall have bronze body, ball and reinforced, water tight seat. Valve shall be two piece construction. Valve shall be "full-port" type. Valve handle shall only require quarter turn to go from full open to full close. The handle shall be removable with vinyl grip. Valve shall be rated for 180 degrees F water temperature and 150 psi working pressure. Ball valve shall be Nibco T-585 for threaded ends and Nibco S-585 for solder ends.

2.1 Reduced Pressure Backflow Preventers: Watts #909 reduced pressure backflow preventers shall be provided with inlet strainer, (2) gate valves for isolation, (3) test ports and air gap fitting. Assembly shall be rated for 110□F water temperature and 175 psi water pressure. RPBP shall be UL listed and meet AWWA C506 standards. All valves 3" and less in size shall bronze body construction, over 3" in size shall have epoxy coated cast iron bodies. Assemblies 2" and under in size shall have threaded ends, over 2" in size shall have flange ends.

2.2 Balancing Valve: Bell & Gossett “Circuit Setter” Model CB or equal balancing valve. All valves to be of bronze body/brass ball construction with glass and carbon filled TFE seat rings. Valves to have differential pressure read-out ports across valve seat area. Read-out ports to be fitted with internal EPT inserts and check valves. Valve bodies to have 1/4" NPT tapped drain/purge port. Valves to have memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position. All valves to have calibrated nameplates to assure specific valve settings. Valves shall be designed for positive shut-off.

PART 3 - TYPES AND APPLICATION - HYDRONIC SYSTEMS:

3.1 Gate Valve (3" and larger): Gate valve shall have cast iron body with cast iron bolted bonnet, non-rising stem, solid cast iron wedge and handwheel. Gate valve shall be rated for 200 psi working pressure. Gate valve shall be Nibco F-619 for flanged ends and Nibco T-619 for threaded ends. Threaded end valve allowed for sizes 3" or less only.

3.2 Globe Valve (2" and under): Globe valve shall have bronze body, bonnet, and disc holder. Globe valve shall have union bonnet, integral seat, teflon or stainless steel renewable disc and be rated for 200 psi working pressure. Globe valve shall be Nibco T-235 for threaded ends or Nibco S-235 for solder ends.

3.3 Check Valves (2" and less): Check valve shall have bronze body, disc, and hinge. Check valve shall be Y-pattern type horizontal swing, renewable disc and rated for 200 psi working pressure. Check valve shall be Nibco T-413 for threaded ends or Nibco S-413 for solder ends.

3.4 Check Valves (2-1/2" and larger): Check valve shall have cast iron body and cast iron bolted bonnet the disc and seat ring shall be bronze. Check valve shall be horizontal swing with renewable seat and disc. Valve shall be rated for 200 psi working pressure. Check valve shall be Nibco F-918 for flanged ends and Nibco T-918 for threaded ends. Threaded ends valve allowed for sizes 3" and less only.

3.5 Ball Valves (for steel or copper piping): Ball valve shall have bronze body, ball and reinforced, watertight seat. Valve shall be two piece construction. Valve shall be "full port" type. Valve handle shall only require quarter turn to go from full open to full close. The handle shall be removable with vinyl grip. Valve shall be rated for 250 degrees F water temperature and 200 psi working pressure. Ball valve shall be Nibco T-585 for threaded ends and Nibco S-585 for solder ends. Provide extended handles for all ball valves installed in insulated piping systems.

3.6 Butterfly Valve: Butterfly valve shall have cast iron body with bronze disc. Valve to have extended neck to allow for insulation and be "lug" type configuration. Interior liner shall be made of EPDM. Lever handle shall be lock type with 10 position settings. Valve to be rated for 200 psi working pressure and be equal to Hammond 6000 Series. Victaulic Vic-300/W761 is acceptable with grooved piping system.

3.7 Strainers (1-1/2" and under): Watts 77S Series "Y" type strainer with cast iron body and threaded ends. Screen shall be 20 mesh stainless steel. Strainer shall be provided with cleanout plug and be rated for 200 psi working pressure.

3.8 Strainers (2” and larger): Metraflex LPD, low pressure drop "Y" type strainer with cast iron body and flanged ends. Screen shall be 304 stainless steel with Cv as follows:

3” Pipe Cv = 227
4” Pipe Cv = 457
6” Pipe Cv = 976

Strainer shall be provided with bolted cleanout and be rated for 200 psi working pressure. Strainer shall be manufactured with .25” pressure differential ports, with one placed on each side of the screen,

3.9 Balancing Valve (4" and less): Balancing valve shall have bronze or cast iron body. Valves to have differential pressure readout ports across valve seat area with integral check valves. Valve shall be equipped with memory stop. Valves to have threaded ends for sizes 3" and less, flanged ends for larger sizes. Valve to be provided with performed molded insulation casing. Design working pressure and temperature to be 200 psi at 250□F balancing valve shall be similar to Bell & Gossett Model CB. Provide with balancing valves, one (1) water gpm readout kit to be turned over to Owner which shall include a differential pressure meter with full scale overrange protection, hoses, readout probes, filters, carry and calculator.

3.10 Triple Duty Valve: Triple duty valve shall be straight pattern type with flange ends and be constructed for cast iron. Valve to be designed to perform as a non-slam check valve, calibrated balancing valve and shut-off valve. Valve to be provided with (2) brass readout ports with integral check valve to obtain flow measurement. Triple duty valve shall be rated for 175 psi working pressure and 250□F. Valve to be similar to Bell & Gossett Model 3DS. Locate a triple duty valve at the discharge of each base mounted pump or where indicated on the drawings. The maximum water pressure drop thru a triple duty valve at rated gpm shall be 5.0 feet.

3.11 Air Eliminator: Amtrol automatic air eliminator with cast iron body and bronze pilot. Unit to be rated for 150 psi working pressure and 250□F working temperature. Pipe discharge to nearest floor drain.

3.12 Automatic Air Vent: Armstrong Model 71 automatic air vent for vertical mounting with brass body and polypropylene float. Vent to be rated for 150 psi working pressure and 240□F working temperature. Pipe discharge to nearest floor drain.

3.13 Manual Air Vent: Armstrong Model 505A manual air vent with brass body. Install with 12" length of 1/4" soft copper discharge piping.

3.14 Pump Drops: Factory assembled grooved end pump drops. Assembly is installation-ready with flexible couplings to accommodate vibration attenuation and stress relief rated for 300 PSI. Victaulic Series, 380, 381, 385, 26. Contractor may utilize three flexible couplings to accommodate noise vibration and attenuation in lieu of above flexible connector.

END OF SECTION 202100

SECTION 202200 – INSULATION - MECHANICAL

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 Work under this section shall include all labor, equipment, accessories, materials, and services required to furnish and install all insulation, fittings and finishes for all mechanical systems specified herein and/or as indicated.

1.3 Application of insulation materials shall be performed in accordance with manufacturer's written recommendations. Where thickness of insulation is not specified, use applicable thickness recommended by manufacturer for specific use.

1.4 Insulation thicknesses shall comply with the latest version of ASHRAE 90.1 and IECC at a minimum.

1.5 All insulation materials shall be installed per the latest edition of the National Commercial and Industrial Insulation Standards.

1.6 Insulation shall be installed by a company regularly engaged in the application of insulation and any work deemed unacceptable by the Engineer shall be removed and properly installed at the expense of the Contractor.

1.7 The Contractor shall photograph any installations prior to concealment. This includes duct risers in chases and at rooftop equipment.

PART 2 – ACCEPTABLE MANUFACTURERS:

2.1 Johns Manville, Knauf, Owens-Corning.

PART 3 – FIRE RATINGS AND STANDARDS:

3.1 Insulations, jackets, facings, adhesives, mastics, tapes, fitting materials, etc. shall have composite fire and smoke hazard ratings as tested by ASTM E-84, NFPA 255 and UL 723 procedures not exceeding Flame Spread 25, Smoke Developed 50 and Fuel Contributed 50.

3.2 All products and their packaging shall bear a label indicating above requirements are not exceeded.

3.3 Fiber glass duct wrap shall meet the requirements of Scientific Certification Systems Certification or Greenguard Validation of Formaldehyde Free.

3.4 Fiber glass mechanical board shall meet the requirement of the Greenguard Standards for Low-Emitting Products.

3.5 Fiber glass pipe insulation shall meet the requirement of the Greenguard Gold level standard.

PART 4 – GENERAL APPLICATION REQUIREMENTS:

4.1 “Concealed", where used herein, shall mean hidden from sight as in trenches, chases, furred spaces, pipe shafts, or above hung finished ceilings. "Exposed" shall mean that piping or

equipment is not "concealed" as defined above. Piping and equipment in service tunnels, mechanical equipment rooms, storage areas, or unfinished rooms is to be considered "exposed".

4.2 Insulation shall be applied on clean, dry surfaces in a neat and workmanlike manner reflecting the best current practices in the trade. Insulation shall not be applied to piping, ductwork or equipment until tested, inspected and released for insulation.

4.3 Where more than one thickness of insulation is required, joints (both longitudinal and transverse) shall be staggered.

4.4 All insulation shall be continuous through walls, ceiling openings and sleeves. However, insulation shall be broken through fire walls. All covered pipe and ductwork is to be located a sufficient distance from walls, other pipe, ductwork and other obstacles to permit the application of the full thickness of insulation specified. If necessary, extra fittings and pipe are to be used. No noticeable deformation of insulation or discontinuity of vapor seal, where required, will be accepted. Coordinate work with plumbers, pipe fitters, etc. to assure hanger locations agree with location of insulation inserts.

4.5 Existing and/or new insulation removed and/or damaged during course of construction shall be repaired or replaced by the Contractor at their expense.

4.6 Vapor barrier jackets shall be applied with a continuous unbroken vapor seal. Do not use staples through the jacket. NO EXCEPTIONS!

4.7 All insulation shall be installed with joints butted firmly together.

4.8 The Contractor shall ensure that all insulation (piping, ductwork, equipment, etc.) is completely continuous along all conduits, equipment, connection routes, etc. carrying cold fluids (air, water, other) and that condensation can, in no way, collect in or on the insulation, equipment, conduits, etc. Any such occurrence of condensation collection and/or damage therefrom shall be repaired solely at the expense of the Contractor.

4.9 Unless otherwise specified or allowed, closed cell type insulation shall not be acceptable.

4.10 Piping and ductwork supports, including hangers, straps, uni-strut and all-thread rods, for insulated piping and ductwork shall be insulated and vapor sealed a minimum of 18” minimum beyond the piping and ductwork to prevent condensing. Coordinate with Sheetmetal Contractor.

PART 5 – PIPING SYSTEMS:

5.1 Seal insulation and jacket at all points where insulation terminates at unions, flanges, valves, and equipment. This applies to hot water lines only as cold water lines require continuous insulation and vapor barrier.

5.2 Pipe insulation shall extend around valve bodies to above drain pans in hydronic equipment over pumps, etc. to ensure no condensation drip or collection.

5.3 Valves, flanges, and unions shall only be insulated when installed on cold fluid piping whose surface temperature will be at or below the dew point temperature of the ambient air.

5.4 Insulation shall not extend through fire and smoke walls. Pack sleeve at fire and smoke wall with approved fire retardant packing similar to mineral wool and seal with approved sealant.

5.5 Metal insulation shields and inserts are required at all pipe hangers where the piping is insulated. Metal shields shall be constructed of galvanized steel, formed to a 180 degree arc. Insulation shields shall be the following size:

Pipe Size	Shield Gauge	Shield Length
2” and less	20	12”
2 ½”- 4”	18	12”
5”- 10”	16	18”
Over 10”	14	24”

5.6 Insulated pipes 2” in diameter and larger shall be additionally supported with wood inserts of sufficient compressive strength to carry the weight of the pipe and fluid. Inserts shall extend beyond extend beyond the hanger and shall be at least 6” in length.

5.7 Provide premolded PVC insulated fitting covers on all pipe fittings, flanges, valves, and pipe terminations. Fittings shall be insulated by applying the proper factory precut insulation insert to the pipe fitting. The ends of the insulation insert shall be tucked snugly into the throat of the fitting and the edges adjacent to the pipe insulation tufted and tucked in, fully insulating the pipe fitting. The proper thickness of insulation must be applied to keep the jacket temperature less than 150°F. An approved vapor retarder mastic compatible with the PVC shall be applied around the edges of the adjoining pipe insulation and on the fitting cover throat overlap seam. The PVC fitting cover shall then be applied and secured with pressure sensitive tape along the circumferential edges. The tape shall extend over the adjacent pipe insulation and have an overlap on itself at least 2" on the downward side. On fittings where the operating temperature is below 50°F, two or more layers of the insulation inserts shall be applied with the first layer being secured with a few wrappings of fiber glass yarn to eliminate voids. One additional insert shall be used for each additional 1" of pipe insulation above 1-1/2". All joints shall be fully sealed.

5.8 PIPE INSULATION MATERIAL: Insulation shall be Knauf "Earthwool 1000° Pipe Insulation ASJ+/SSL+" or approved equivalent fiberglass pipe insulation with an all service jacket. The insulation shall be a heavy density, pipe insulation with a K factor not exceeding 0.27 Btu per inch/h. ft² °F at 75°F mean temperature. The insulation shall be wrapped with a vapor barrier jacket. The jacket shall have an inside foil surface with self sealing lap and a water vapor permeability of 0.02 perm/inch. All circumferential joints shall be vapor sealed with butt strips. All insulation shall be installed in strict accordance with the manufacturer’s recommendations. The following pipes shall be insulated with the minimum thickness of insulation as noted.

5.8.1 Domestic Cold Water: 1" thick insulation

5.8.2 Roof Drain Piping: 1” thick insulation (Horizontal piping for primary & overflow systems)

5.8.3 Domestic Hot Water & Return Lines:

- Piping 1-1/4" and less: 1" thick insulation
- Piping 1-1/2"" and greater: 1-1/2” thick insulation

5.8.4 Refrigerant Suction Lines:

- Piping 1-1/4" and less: 1/2” thick insulation
- Piping 1-1/2" and greater: 1" thick insulation
- All exterior piping: 1-1/2” thick with jacketing

5.8.5 Condensate Drain Lines: 1/2" thick.

5.8.6 Tower/Boiler Water Source Heat Pump Piping: Does Not Require Insulation

5.8.7 Floor Drain Sanitary Pipes: All floor drains that have condensate spilled to the drain, and the sanitary pipe is not below slab, shall have its respective sanitary pipe insulated with 1" thickness. Insulate the pipe until it connects to a 4" main, but a minimum of 20 feet in the direction of flow.

5.9 EXPOSED, INTERIOR (MECHANICAL ROOMS, INTERIOR FINISHED ROOMS, STORAGE ROOMS, ETC.) PIPING JACKETS: All insulated piping installed in the above areas within eight (8) feet of finished floor shall have a 6 oz. canvas jacket with fire retardant lagging apply to the insulation specified for the piping. Note, this item is not applicable to Mezzanines.

5.10 EXPOSED, EXTERIOR PIPING JACKETS: In addition to the insulation specified for the exterior pipe, provide .016" aluminum jacket or Ceel-Co "Ceel-Tite 300 Series UVR" plastic jacket. The jackets shall be installed as recommended by the manufacturer to maintain watertight seal on all exposed piping including elbows. All longitudinal and transverse seams to be sealed watertight.

PART 6 – DUCTWORK SYSTEMS:

6.1 Duct sizes indicated are the net free area inside clear dimensions; where ducts are internally lined, overall dimensions shall be increased accordingly.

6.2 Duct insulation shall extend completely to all registers, grilles, diffusers, and louver outlets, etc., to ensure no condensation drip or collection.

6.3 EXTERNAL INSULATION FOR SUPPLY, OUTSIDE AIR DUCTWORK: Knauf "Friendly Feel" faced, Duct Wrap, 0.75 PCF density, 2.2" thick or approved equivalent. Wrap shall be factory laminated to a reinforced foil kraft vapor barrier facing (FRK) with a 2" stapling flange at one edge. The installed R value shall be a minimum of 6.0. Flame spread 25, smoke developed 50, vapor barrier performance 0.02 perms per inch.

6.4 INTERNAL INSULATION: Duct liner shall be 1” thick flexible elastomeric insulation (Armaflex AP Duct Liner). K=0.27 BTU in./hr. ft^2 °F @ 75°F.

6.5 DUCT SOUND ABSORBER / DUCTWRAP: In addition to the duct insulation specified, install 1" thick Kinetics KBC-100RBQ (or Sound Seal BBC-1 B-10FS QFA-1) limp barrier material (1.3 lb/sq ft), reinforced with a fiber glass screen, loaded with barium sulphate, with a quilt faced fiber glass absorber on one side. Install per manufacturer’s instructions. Minimum sound transmission loss per octave band shall be 125Hz-10dB/250Hz-16dB/500 Hz-22dB/1000Hz-30dB/2000Hz-39dB/4000Hz-43dB/STC-27. Provide steel banding to ensure restraint of duct wrap.

PART 7 – MECHANICAL EQUIPMENT:

7.1 ROOF DRAIN SUMPS: Knauf "Pipe and Tank Insulation" or approved equivalent rigid board insulation with exterior vapor barrier jacket formed to bottom of sump basin. Insulation shall have a K factor of 0.26 at 100°F. mean temperature. Insulation shall be 1" thick. Insulation shall be formed to roof drain sump. Vapor barrier shall remain continuous.

END OF SECTION 202200

SECTION 202300 – THERMOMETERS, PRESSURE GAUGES AND OTHER MONITORING INSTRUMENTS

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 The Contractor shall include all thermometers, pressure gauges and/or compound gauges at the locations indicated. All pressure gauges and/or compound gauges shall be provided with ¼ turn ball valves to allow the gauge to be removed and replaced without shutting down system.

PART 2 – THERMOMETERS AND PRESSURE GAUGES:

2.1 Gauges and thermometers shall be Miljoco, Marsh, Trerice, or Weksler.

2.2 All thermometers and pressure gauges shall be readable from a standing position on the floor. Mount thermometers in approved wells. Use sensing elements of appropriate length for pipe size. Do not make direct contact of base with fluid in pipe. Pressure gauges and thermometers subject to vibration shall be mounted remotely away from vibrating pipe surface, etc. with flexible tubing.

2.3 Digital thermometers shall be solar powered industrial thermometer. The range shall be -50°F/300°F with an accuracy of 1% or 1°, whichever is greater. The display shall be a 3/8” LCD digit. Use where specifically indicated on the drawings.

2.4 Water thermometers shall be blue-reading spirit liquid-in-glass type with 9” scale, powder coated cast aluminum case and stem socket of length as required by system. Accuracy to be plus or minus 1 scale division. Lens to be plastic. Hot water thermometer shall have a 30°F to 240°F range and chilled water and geothermal water thermometer shall have a 0°F to 120°F range.

2.5 Pressure gauges shall be Bourdon Type, circular, 4-1/2" face, black letters on white face graduated in 2 PSI or less and shall be manufactured for service intended. Provide with pig tail connectors and gauge cocks. Accuracy to be plus or minus 1%. Water pressure and low pressure steam gauges shall have 0 to 100 PSI range and medium/high pressure steam gauges shall have 0 to 200 PSI range.

2.6 Provide direct mount Bimetal dial thermometers in HVAC ductwork. Thermometer shall be 3" diameter, with polycarbonote plastic lens and stainless steel case. Air temperature range shall be 25°F to 125°F.

PART 3 – PRESSURE/TEMPERATURE PORT (PETE’S PLUG – P/T PLUG):

3.1 Provide 1/4" NPT fitting to receive either a temperature or pressure probe, 1/8" OD. Fitting shall be solid brass with two valve cores. Valve core material to be neoprene for temperatures up to 200ºF and Nordel for temperatures up to 275ºF. Pete’s Plugs to have 3" length when installed on insulated pipes and 1-1/2" length for uninsulated pipes. Pete’s Plug to be fitted with a cap and gasket and shall be rated at 1000 PSIG at 140ºF.

3.2 The installing contractor shall supply the Owner (4) pressure gauges with 1/8" OD probe and (4), five-inch stem pocket testing thermometers rated for 0-220ºF water and 4, 50-550ºF water thermometers.

END OF SECTION 202300

SECTION 202400 - IDENTIFICATIONS, TAGS, CHARTS, ETC.

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

PART 2 – TAGS AND CHARTS:

2.1 Provide and install on each valve 1” in size or greater for all mechanical systems a 1.5" diameter circular bronze or baked phenolic tag fitted to each valve so that it cannot be removed. Each tag shall be embossed consecutively with sequential number identifiers. Number identifiers shall be determined by the Contractor sequentially.

2.2 Provide typewritten valve charts indicating each valve identifier, the valves service, normal position, and its location. Also furnish one electronic copy on CD in “*.xls” format. One (1) copy of this chart shall be mounted in suitable frame(s) with clear plastic covers in a conspicuous location in each of the major mechanical rooms. Repeat only main valves which are to be operated in conjunction with operations of more than single mechanical room.

2.3 All emergency shutoff valves shall be identified with a permanent engraved tag hung from the valve with 1-inch high lettering. Emergency shutoff valves shall be identified as any valve whose closure could create an emergency condition in the facility (i.e., natural gas, water, domestic hot water, main HVAC valves, etc.).

2.4 Label all control panels and disconnect switches with service and equipment served.

PART 3 – PIPING AND DUCTWORK IDENTIFICATION:

3.1 All piping and ductwork installed shall be identified according to the charts hereinafter specified. Provide stenciled markers and arrows indicating direction of flow on all piping and ductwork installed under this contract. Markers and arrows shall be painted on the piping and ductwork using machine cut stencils. All letters shall be sprayed using fast drying lacquer paint. All markers and arrows shall be properly oriented so that descriptive name may be easily read from the floor. Piping and ductwork shall be identified on twelve (12) foot centers. All piping and ductwork shall be minimally identified once above all room ceilings and where it passes thru walls or floors. At the Contractor's option, Setmark or equivalent manufactured marking system may be substituted for field marking.

3.2 The following table describes the size of the color field and size of the identification letters which shall be used for pipes of different outside pipe diameters.

Outside Diameter	Label Length	Letter Size
¾” – 1 ¼”	8”	½”
1 ½” – 2”	8”	¾”
2 ½” – 6”	12”	1 ¼”
8” – 10”	24”	2 ½”
Over 10”	24”	3 ½”

3.3 The following chart describes the pipe service and label identification which shall be used for various pipes.

PIPE	ABBREVIATION
Boiler / Tower Supply	C.S.
Boiler / Tower Return	C.R.
Domestic Cold Water	D.C.W.
Domestic Hot Water	D.H.W.
Recirculated Hot Water	R.H.W.
Soft Water	SOFT WATER
Natural Gas	NAT.GAS.
Refrigerant Piping	RL/RS
Fire Protection	SPRINKLER
Sanitary Sewer Piping	SAN
Sanitary Vent Piping	VENT
Storm Sewer Piping	STORM

PART 4 – PAINTING OF PIPING:

4.1 Not required

PART 5 – NATURAL GAS PIPING IDENTIFICATION:

5.1 All natural gas piping within mechanical rooms shall be painted safety orange. Natural gas valves shall be painted red. Piping shall be prepped as required and piping shall be painted with at least two coats of paint or more if required to properly cover the piping. Piping in the kitchen shall be painted black. Exterior gas piping shall be painted to match the building with color as directed by the Architect/Owner.

5.2 In addition, natural gas piping and meter loop piping shall be painted color as selected by Architect. Do not paint over gauges, name plates or vent/regulator openings.

PART 6 – EQUIPMENT IDENTIFICATION:

6.1 Unless otherwise specified, all equipment shall be identified. The titles shall be short and concise, and abbreviations may be used as long as the meaning is clear. In finished rooms and mechanical rooms, equipment shall be identified neatly and conspicuously with engraved black lamacoid plates (or equivalent) with 1” high white letters on the front of each piece of equipment.

6.2 All mechanical equipment and associated starters/disconnects shall have the electrical panel number and circuit number identified on a lamacoid plate. Coordinate with the Electrical Contractor.

PART 7 – DUCTWORK IDENTIFICATION:

7.1 All ductwork shall be identified as to the service of the duct and direction of flow. Include equipment designator on SA & RA ductwork. The letters shall be at least two inches high, and the flow arrow shall be at least six inches long. The letters and flow arrow shall be made by precut stencils and black oil base paint with aerosol can. Concealed ducts also need to be identified.

7.2

DUCTWORK	ABBREVIATION
Supply Air Ductwork	SA + Equipment Identifier
Return Air Ductwork	RA + Equipment Identifier
Exhaust Air Ductwork	EA + Equipment Identifier
Outside Air Ductwork	OA + Equipment Identifier

PART 8 – ACCESS THROUGH LAY-IN CEILINGS:

8.1 Mark each lay-in ceiling panel which is nearest access to equipment, valves, dampers, filters, duct heaters, etc., with colored tape labels located on the ceiling grid.

END OF SECTION 202400

SECTION 202500 - HANGERS, CLAMPS, ATTACHMENTS, ETC.

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 Each Contractor's attention is also directed to Specification Section PIPE, PIPE FITTINGS AND SUPPORT.

1.3 This section includes, but is not limited to, furnishing, and installing supports, anchors, and accessories for piping, ductwork, equipment, etc. Furnishing and installing shall be by each trade for the completion of their work as directed in this Section.

PART 2 – MATERIALS AND EQUIPMENT:

2.1 HANGERS, CLAMPS, ATTACHMENTS SCHEDULE:

- ACCEPTABLE MANUFACTURERS: Grinnell, Elcen, Fee & Mason.
- All hangers, clamps and attachments shall be manufactured products.
- Pipe Rings (2” pipe and smaller) – adjustable swivel split ring or split pipe ring.
- Pipe Clevis (2.5” pipe and larger) – adjustable wrought clevis type.
- Pipe Clevis (All pipe sizes) – steel clevis for insulated pipe.
- Riser Clamps (All pipe sizes) – extension pipe or riser clamp.
- Beam Clamps (All pipe sizes) – malleable beam clamp with extension piece.
- Brackets (All pipe sizes) – medium weight steel brackets.
- Concrete Inserts (All pipe sizes) – wrought or wedge type inserts.
- Concrete Fasteners (All pipe sizes) – self-drilling concrete inserts.
- Rod Attachments (All pipe sizes) – extension piece, rod coupling, forged steel turnbuckle
- U-bolts (All pipe sizes) – standard u-bolt.
- Welded Pipe Saddles (All pipe sizes) – pipe covering protection saddle sized for thickness of insulation.
- Pipe Roll (All pipe sizes) – adjustable swivel pipe roll.
- Protection Saddle (All pipe sizes) – 180 degree coverage, sheet metal pipe protection saddle.
- Hanger Rods (All pipe sizes) – Steel, diameter of hanger threading.
- Concrete Channel Inserts (All pipe sizes) – continuous heavy duty slot inserts unistrut.
- Adjustable Spot Inserts (All pipe sizes) – continuous heavy duty spot insert unistrut.
- Miscellaneous steel such as steel angles, rods, bars, channels, etc used in framing for supports, fabricated brackets, anchors, etc. shall confirm to ASTM-A-7.

2.2 HANGER RODS

2.2.1 Hanger rods or single rod hangers shall conform to the following:

PIPE SIZE	HANGER ROD DIAMETER STEEL PIPE	HANGER ROD DIAMETER COPPER, PLASTIC, HDPE
2” and smaller	3/8”	3/8”
2-1/2” through 3-5/8”	1/2”	1/2”
4” and 5”	5/8”	½”
6”	3/4”	5/8”
8” through 12”	7/8”	3/4”
14”	1’	7/8”

2.3 Rods for double rod hangers may be reduced on size. Minimum rod diameter is 3/8 inches.

2.4 Hanger rods and accessories used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.

PART 3 – INSTALLATION:

3.1 Supporting and hanging shall be done so that excessive load will not be placed on any one hanger so as to allow for proper pitch and expansion of piping.

3.2 Hangers and supports shall be placed as near as possible to joints, turns, and branches.

3.3 For concrete construction, utilize adjustable concrete inserts for fasteners. Expansion anchors and power driven devices may be used when approved in writing by the Architect/Engineer.

3.4 Utilize beam clamps for fastening to steel joists and beams. Expansion anchors in masonry construction. Do not support piping or ductwork from bridging or metal decking.

3.5 When piping is routed in joists, piping shall be top mounted on trapeze type hangers with each pipe individually clamped to trapeze hanger. Do not support piping or ductwork from bridging angles.

3.6 Trapeze hangers are not allowed, unless specifically approved by the Engineer.

3.7 Install all miscellaneous steel other than designed building structural members as required to provide means of securing hangers, supports, etc., where piping does not pass directly below or cross structural elements.

3.8 Piping shall not be supported by the equipment to which it is connected. Support all piping so as to remove any load or stress from the equipment.

3.9 Where piping, etc., is routed vertically, approved riser clamps, brackets or other means shall be utilized at approximately 10'-0" center to center minimum. An approved adjustable base stand or fitting on concrete support base shall be utilized at the base of the vertical run.

3.10 Where piping is routed along walls, knee braced angle frames, etc. pipe brackets with saddles, clamps, and rollers mounted on structural brackets fastened to walls or columns shall be used.

3.11 Support all ceiling hung equipment with approved vibration isolators.

3.12 Where copper tubing is specified, hangers shall be of copper clad type when piping is uninsulated.

3.13 Uninsulated piping hung from above shall be supported with ring and clevis type pipe hangers. Uninsulated piping mounted on trapeze (when allowed) and wall bracket type support shall be held in place with U-bolts. U-bolts shall allow for axial movement in the piping.

3.14 All insulated piping shall be supported with clevis type and pipe roll hangers. Hangers shall be sized to allow the pipe insulation to pass through the hangers. Install insulation protection saddles at all hanger locations. Welded pipe saddles shall be installed at all hangers on piping 5" and larger. The pipe saddles shall be sized for the thickness of insulation used. Hangers shall fit snugly around outside of insulation saddles.

3.15 Under no conditions will perforate band iron or steel wire driven hangers be permitted.

3.16 Support steel and copper piping at a minimum of eight (8) foot intervals for piping 3" and smaller and ten (10) foot intervals for larger piping. Provide additional support at end of the branches and change of direction.

3.17 Support plastic pipe at intervals not to exceed four (4) feet and at the end of the branches and at the change of direction and shall be installed as to permit freedom of movement. Vertical piping shall be supported at their bases and all upward movement shall not be restricted. Hangers shall be at least one (1) inch wide and shall not compress, distort, cut, or abrade the piping to allow free movement at all times.

3.18 Where fireproofing is dislodged/damaged from the building structure due to Contractor's installation of hangers, clamps, etc., it shall be the Contractor's responsibility to repair all dislodged/damaged fireproofing to original fireproofing rating. This shall also include all work performed by their contractors' sub-contractors.

3.19 Ensure that all bolts and nuts are tightened.

END OF SECTION 202500

SECTION 203100 - TESTING, BALANCING, LUBRICATION AND ADJUSTMENTS

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 The Engineer, or authorized representative, shall be notified by the Contractor twenty-four (24) hours in advance of any tests called for in these Specifications or required by others.

1.3 Only after written approval, signed by the Engineer, shall the Contractor apply insulation or paint or allow the work to be furred-in. This written approval, however, does not relieve the Contractor of the responsibilities for any failure during the guarantee period. The expense of all tests shall be borne by the Contractor, along with all temporary equipment, materials, gauges, etc. required for tests.

1.4 Contractor shall notify TAB Agency in writing that the domestic water system has been flushed, cleaned and ready for sterilization or sanitizing. No chemicals are to be added to this system until all balancing has been completed risk of contamination. The TAB firm is to properly notify all parties in writing when they have completed this portion of testing. If not properly coordinated, then the system will require additional sterilization and sanitizing at the Contractor’s expense. Refer to PIPE, PIPE FITTINGS AND PIPE SUPPORT Specification Section.

PART 2 - HEATING, VENTILATING AND AIR CONDITIONING TESTING:

2.1 The test and balance of this system shall be by a Contractor who employs only the services of a certified AABC or independent NEBB firm whose sole business is to perform test and balance services.

2.2 The test and balance contractor shall bid directly to the Construction Manager or Owner.

2.3 Mechanical Contractor shall provide all start-up documents to Test and Balance Contractor prior to any test and balance services.

2.4 The Mechanical Contractor shall test all piping before being insulated or concealed in any manner. Where leaks or defects develop, required corrections shall be made and tests repeated until systems are proven satisfactory. Water piping systems shall be subjected to a hydrostatic test as specified and shall be proven tight after a twenty-four (24) hour test.

2.5 All motors, bearings, etc. shall be checked and lubricated as required during start-up procedures. All automatic, pressure regulating, and control valves shall be adjusted. Excessive noise or vibration shall be eliminated.

2.6 System balancing, where required, shall be performed only by persons skilled in this work. The system shall be balanced as often as necessary to obtain desired system operation and results.

2.7 All fan belts shall be adjusted for proper operation of fans.

2.8 Testing shall occur after completion of the ceiling systems installation.

2.9 All deficiencies observed by the Test and Balance Contractor shall be reported immediately to the Engineer and Mechanical Contractor.

2.10 Refer to Specification Section – CONTROLS – DIRECT DIGITAL for additional requirements.

2.11 Refer to Specification Section – GENERAL PROVISIONS – MECHANICAL for startup requirements.

2.12 Provide a preliminary test report to the Engineer immediately after the system is air balanced, or any initial phases are balanced. This report may be handwritten. Any systems that are not found to operate within the design tolerances by the Test and Balance Contractor shall immediately be reported to the Engineer via telephone call to attempt to determine a resolution while the Test and Balance Contractor is still on site. Additional compensation will not be accepted for additional trips.

2.13 Anticipate visiting the site again after the Engineer has reviewed the report. The Engineer may request up to two (2) additional site visits for onsite troubleshooting where additional measurements may be required.

2.14 For the purpose of placing the Heating, Ventilating and Air Conditioning systems in operation according to design conditions and certifying same, final testing and balancing shall be performed in complete accordance with AABC Standards for Total System Balance, 7th edition for air and hydronic systems as published by the Associated Air Balance Council.

2.15 THE FOLLOWING SYSTEMS SHALL BE TESTED AND BALANCED:

- The supply, return, outside and exhaust air duct systems. Provide static pressure profiles thru each system. Static pressure profiles shall include all sections from the return duct inlet and supply duct outlet of the heat pump unit. Show accurate representation of return, relief, outdoor and economizer damper locations. On units equipped with exhaust air fans; show location and profile of the exhaust fan.
- Exhaust air in each room to within 10% of design air flow rate.
- Heat pump total air flow, discharge, and inlet pressures.
- Hydronic and domestic pumps total water flow.
- Balance heat pump water-to-water loop, circulating pumps and associated coil water flows.
- Verify calibrations of the duct static pressure and water pressure sensors for all systems.
- Balance each heat pump unit and adjust ECM motor to design airflow. Record inlet and outlet static pressure, including filters. Measure outside air flow at each heat pump.
- Balance all supply and return air grilles to within 10% of design air flow rate.
- Balance all exhaust air fans and record inlet static pressure.
- Balance the kitchen rangehood supply/exhaust air system.

2.16 Balance all units rated for 2,000 cfm unit such that the total air volume delivered does not exceed 2,000 cfm, otherwise the Contractor shall furnish and install a code compliant duct smoke detection system integrated into the building's system.

2.17 Balance the water flow rate of each domestic hot water recirculating pump. Set the flow rate for each balancing valve in the recirculating hot water system. If flow rates are not indicated, contact the engineer for each balance valve GPM.

2.18 Instruments used for testing and balancing of air and hydronic systems shall have been calibrated within a period of six months prior to balancing. All final test analysis reports shall include a letter of certification listing instrumentation used and last date of calibration.

2.19 Test and Balance agency shall provide sizing of fan or motor sheaves required for proper balance. The Mechanical Contractor shall purchase and install all sheaves and belts as required. This includes new and existing equipment.

2.20 Three (3) copies of the complete test reports shall be submitted to the Consulting Engineer prior to final acceptance of the project. Preliminary test reports shall be submitted when requested.

2.21 The Contractor shall provide and coordinate work to provide sufficient time before final completion date so that tests and balancing can be accomplished and provide immediate labor and tools to make corrections when required without undue delay.

2.22 The Contractor shall put all heating, ventilating and air conditioning systems and equipment and rangehood system into full operation and shall continue the operation of same during each working day of testing and balancing.

2.23 The Test and Balance Contractor shall be present during the Engineer's final inspection of the building, or a separate project review date. The Engineer may request confirmation of the air balance report by asking for new measurements to be taken at that time. Any information in the test and balance report may be asked to be reconfirmed.

END OF SECTION 203100

SECTION 210100 - FIRE PROTECTION SYSTEM

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 No Contractor, other than those regularly engaged in the installation of approved and franchised automatic sprinkler systems will be considered or approved for the work under this Specification Section. The Contractor shall have not less than five (5) years experience in the fabrication and erection of fire protection systems as specified. The Contractor shall have completed five (5) installations similar and equivalent in scope to the systems specified.

1.3 Before submitting bid, examine the Contract Documents, visit the site (if necessary) and become acquainted with all conditions that may, in any way whatsoever, affect the execution of this work. The Contractor shall take their own measurements and be responsible for exact size and location of all openings required for installation of this work. Figured dimensions where indicated are reasonably accurate and should govern in setting out work. Detailed method of installation is not indicated. Where variations exist between described work and approved practice, the Engineer shall be consulted for directive.

1.4 It is the intent of the Plans and Specifications to provide a general layout only and locate major equipment, components, piping, etc. Variations in head locations, pipe routing, etc., shall be anticipated by the Contractor and shall be coordinated with all other trades and indicated on the drawings and descriptive literature called for hereinafter. It shall be the express responsibility of the Contractor to provide all required design, materials and equipment and perform all work required to install a complete and approved installation.

1.5 All materials and methods shall be in accordance with applicable codes, regulations and/or ordinances and meet approval of local inspection authority and the State Fire Marshal. Also, all work shall comply with the latest editions of the National Board of Fire Underwriters, National Fire Protection Association, OHSA Regulations, the International Building Code, the Life Safety Code, International Mechanical Code, and governing building codes. All materials and equipment installed as a part of this work shall be listed by the Underwriters Laboratories, Inc. as approved for fire protection installations.

1.6 Where flow and pressure data are available, they are indicated on the project drawings. The Contractor shall independently verify all such information and notify the Engineer of any discrepancies discovered prior to beginning the work. Where no flow information is indicated on the project drawings, the Contractor shall obtain the data and indicate it on the shop drawing submittal. All flow information obtained shall be less than six (6) months old. Piping systems shall be hydraulically sized based on the most conservative flow information obtained. No adjustments in the contract amount will be allowed for failure of the Contractor to obtain adequate flow information.

1.7 All sprinkler piping (new & existing) shall be concealed above ceilings. Contractor shall be responsible for modifying the elevation of the existing sprinkler piping as necessary to conceal piping above the ceiling. Coordinate all ceiling related work with the architectural reflected ceiling plans. This includes but is not limited to the following: ceiling height changes, soffits, headers, lights, diffusers, grilles, speakers, cameras, fire alarm devices, etc. Refer to the architectural, electrical, and mechanical drawings for additional information.

1.8 The Owner's local insuring agency may review plans prepared and submitted by the Contractor but shall have no authority to make changes once work has begun. Coordinate with the Owner prior to construction.

1.9 All work performed under this section shall be accomplished in close harmony with all other trades. All work not so coordinated shall be removed and reinstalled at the expense of the Contractor.

1.10 The Contractor shall list the following cost breakdowns, material, and labor, on the official project schedule of values:

- Fire Protection Shop Drawings and Approvals
- Fire Protection Materials & Labor
- Fire Protection Record Drawings & Acceptance

1.11 Unless otherwise indicated, all materials shall be new and of the best grade and quality for type specified. Materials shall comply with the "Buy American Act".

1.12 Where piping is not indicated on the plans, but is obviously or apparently required, contact Engineer prior to submission of the bid.

1.13 All piping shall be capped or plugged during erection as required to keep clean and debris moisture free.

1.14 All piping shall be installed straight and true, parallel, or perpendicular to the building construction. Piping shall be installed to allow for expansion without damage to the building finishes, structure, pipe, equipment, etc., use offsets, U-bends or expansion joints as required. No mitered joints or field fabricated pipe bends shall be accepted. Pipe shall clear all windows, doors, louvers, and other building openings.

1.15 All pipes shall be supported in a neat and workmanlike manner and wherever possible, parallel runs of horizontal piping shall be grouped together on hangers. Vertical risers shall be supported as each floor line with approved steel pipe riser clamps. Spacing of pipe supports shall not exceed eight (8) foot intervals for pipes 3" and smaller and ten (10) foot intervals on all other piping. Small vertical pipes (1" and less) shall be bracketed to walls, structure members, etc. at four (4) foot intervals to prevent vibration or damage by occupants.

1.16 The use of wire or perforated metal to support pipes will not be permitted. Hanging pipes from other pipes shall not be permitted.

1.17 Support piping with standard pipe hangers with C-clamp connection to main structural members, use angle steel cross pieces between main structural members where required to provide rigid support.

1.18 Where piping rests directly on a hanger, clip, bracket, or other means of support, the xxx element shall be of the same material as the pipe, (e.g., copper to copper, ferrous to ferrous, etc.) or shall be electrically isolated one from the other so as to prevent pipe damage by electrolysis. Pay particular attention and do not allow copper pipe on ferrous structural members, equipment, etc. without electrolytic isolation. This includes temporary support require Construction.

1.19 In general, piping shall be installed concealed except in mechanical rooms, etc. unless otherwise indicated, and shall be installed underground or beneath concrete slabs only where indicated. All lines at ceiling shall be held as high as possible and shall run to avoid conflicts with other trades, and to facilitate the Owner's use and maintenance. Location of pipe in interior partitions shall be carefully coordinated with whoever will construct the partitions after the piping is in place. Where exposed risers occur, they shall be kept as close to walls as possible.

1.20 Pipe shall be cut accurately to measurements established at the building by the Contractor and worked into place without springing or forcing. All pipes shall be reamed to full pipe diameter before joining and before assembling. All lengths of pipe shall be set vertically and taped with a hammer to remove scale and dust and inspected to ensure that no foreign matter is logged therein.

1.21 Piping carrying water or other fluids subject to freezing shall not be installed in locations subject to freezing. If in doubt, consult Engineer.

1.22 Pay particular attention to conflict of piping with other work. Do not install until conflict is resolved. If in doubt, consult Engineer.

1.23 Piping materials in each system shall, to the extent practicable, be of the same material. Frequent changes of material (for example, from copper to steel) shall be avoided and in no case shall be accomplished with use of insulated unions and permission of the Engineer.

PART 2 – SCOPE OF WORK:

2.1 Furnish all material, labor, tools, equipment, and supervision required for modifications to the existing fire protection system as indicated on the project drawings and within these specifications. Include all necessary piping, sprinkler heads, test connections, valves, drains, etc.

2.2 The Contractor shall provide flushing and sterilization of all water lines in accordance with current Codes, Rules and Regulations and shall make connection to domestic water mains in accord with current rules and regulations of the State Department of Sanitary Engineering and Division of Water.

2.3 The Contractor shall obtain and pay for all necessary state, municipal, county, city and other permits and fees and pay all State taxes which are applicable.

2.4 All workmanship, equipment and material shall be guaranteed in writing against defects from any cause, other than misuse, for a period of one year from substantial completion.

2.5 Upon completion, the Contractor shall submit to the Engineer, a properly completed "Sprinkler Contractor's Certificate Covering Materials and Tests” form.

2.6 Upon completion of this work all debris, material, and equipment shall be removed from the building and premises; all piping shall be cleaned ready for finish painting. Do not remove rust inhibitive primer specified hereinafter.

PART 3 – SHOP DRAWINGS:

3.1 The Contractor shall prepare and submit to the Engineer, shop drawings including design calculations, detailed catalog cutsheets and layout drawings indicating the proposed automatic sprinkler system. All layouts and drawings shall be closely coordinated by the Contractor with the work of ALL other trades. The shop drawings shall indicate the following items:

- Name and address of Owner, Architect and Engineer.
- Sprinkler heads including temperature rating.
- Fire department connection.
- Post indicator valve.
- Detector check valves.
- Water motor gong.
- Flanged gate and check valves.
- Pipe hangers.

- Supervised O.S & Y valve.
- The post indicator supervisory switch (coordinated with the Fire Alarm Contractor).
- The main gate valve supervisory switch (coordinated with the Fire Alarm Contractor).
- The flow switch (coordinated with the Fire Alarm Contractor).

3.2 On a set of drawings to the same scale as the drawings accompanying these specifications, indicate:
- Each head location coordinated with lights, diffusers, and other ceiling mounted device.
- Location of all risers, mains, runout lines, etc.
- Size of all risers, mains, runout lines, etc.
- Location and type of pipe hangers.
- All other information required by the Authority Having Jurisdiction providing approval.

3.3 The Contractor shall submit these shop drawings to the Engineer through the General Contractor and Architect for their review and approval. The Contractor shall submit the reviewed drawings to the Authority Having Jurisdiction for their review and approval. The Contractor shall incorporate all review comments from the Engineer and the Authority Having Jurisdiction. No work shall be performed onsite until all review processes are complete and updated drawings are on the job site.

PART 4 – EQUIPMENT AND MATERIALS:

4.1 EXTERIOR PIPE & FITTINGS: Class 200 PVC piping for exterior fire protection piping. Piping shall meet AWWA C900 requirements, be UL listed, Factory Mutual approved and NSF approved. Joints shall have spigot pipe ends with a flexible elastomeric ring seated in a groove to provide watertight seal. Minimum burst pressure to be 900 psi when tested in accordance with ASTM D1599. No. 8 copper wire (tracer wire) shall parallel all piping.

4.2 POST INDICATOR VALVE: Furnish and install a post indicator valve as required by the local authority. It shall be listed and approved by Underwriters Laboratories and Associated Factory Mutual Laboratories; Marked SV-FM; vertical; non-adjustable; with electric supervisory switch, handle, view window, brass padlock with two (2) keys; gate valve to meet gate valve specifications, except to have non-rising stem and mechanical joint ends; equivalent to Mueller, Scott or Lunkenheimer.

4.3 DETECTOR CHECK VALVE: Furnish and install detector check valve as required by the local authority. It shall be listed and approved by Underwriter Laboratories and Associated Factory Mutual Laboratories; 175# working pressure; IBBM; flanged; with tapped bosses each side for by-pass meter trimming; equivalent to Victaulic, Badger, or Grinnell.

4.4 The Contractor shall contact the servicing water company and ascertain their policy pertaining to the bypass water meter. If not furnished by water company, the Contractor shall furnish and install the bypass meter and trimming as detailed on the drawings.

4.5 FIRE DEPARTMENT CONNECTION: Furnish and install a fire department connections with threads as approved by the local fire department; cast brass polished and chromium plated; with connection sizes and lettering as directed by the local authority having jurisdiction; Viking, Automatic Sprinkler Corporation, or approved equivalent.

4.5.1 At the low point near each fire department connection, install a 90-degree elbow with drain connection to allow for localized system drainage to prevent freezing. Basis of Design: Victaulic #10-DR.

4.6 SIAMESE HOSE FIRE DEPARTMENT CONNECTION: Furnish and install on the fire protection pit as required by the local authority having jurisdiction, a Siamese hose connection with threads

as approved by the local Fire Department. Unit shall be similar to Larsen's No. 15 sidewalk Siamese, size: 2½" x 2½" x 6". Coordinate threads type with local Fire Department.

4.7 WET ALARM VALVES: All alarm valves must be UL and FM approved. Alarm valve shall have a grooved seat design with retarding chamber. Valve shall be rated for 225 PSI working pressure. Valve shall be provided with external bypass line and drain valve. Valve internal components shall be replaceable without removal of valve from installed position. Basis of Design: Victaulic Series 751. Engineer approved equal Reliable, Gem, Grinnell, Star, Viking.

4.8 FLOW INDICATOR SWITCHES: Furnish and install flow indicator switches as required by NFPA 13. All flow indicator switches shall be UL approved. Coordinate with Fire Alarm System supplier/installer.

4.9 TAMPER SWITCHES FOR WATER SHUT-OFF VALVES: Furnish and install tamper switches where required by NFPA 13. All tamper switches shall be UL approved. Coordinate with Fire Alarm System supplier/installer. All tamper switches located in fire protection pits shall be waterproof, capable of operating beneath water and be NFPA approved.

4.10 BUTTERFLY VALVES: 2” AND OVER; listed and approved by UL and FM; 300-psi working pressure, grooved ends, ASTM A536, Grade 65-45-12, ductile iron body, electroless-nickel plated ductile iron disc, pressure-responsive elastomer seat and stainless steel stem. (Stem offset from the disc centerline to provide complete 360-degree circumferential seating.) Valve complete with weatherproof actuator housing with handwheel and supervisory switches. Basis of Design: Victaulic Series 705.

4.11 GATE VALVES: 2½" and over; listed and approved by UL and FM; marked SV-FM; 175# working pressure; 1 BBM; OS&Y; flanged or grooved ends; cast iron discs; bronze seat rings; four point wedging mechanism; Basis of Design: Victaulic Series 771, or engineer approved equivalent to Mueller, Scott or Lunkenheimer. 2" and under; 150# working pressure; bronze; rising stem; screwed; bronze discs; bronze seat rings; two point wedging mechanism; equivalent to Jenkins, Scott or Lunkenheimer.

4.12 CHECK VALVES: 2½" and over; listed and approved by UL and FM; marked SV-FM; 250 psi working pressure with grooved ends or 175# working pressure; 1 BBM; flanged; Basis of Design: Victaulic Series 717, or engineered approved equivalent to Mueller, Scott, or Lunkenheimer. 2" and under; 150# working pressure; bronze; screwed; equivalent to Jenkins, Scott, or Lunkenheimer.

4.13 INTERIOR PIPE & FITTINGS: Up to 2" Schedule 40 ASTM A-53 black steel; 125# cast iron screwed fittings or Schedule 10, ASTM A-135 black steel with victaulic or similar type approved fittings. 2½" and larger: Schedule 40 black steel with flanged, welded or victaulic (or similar) type approved fittings or Schedule 10, ASTM A-135 black steel with victaulic or similar type approved fittings.

4.13.1 Grooved joint couplings consisting of two ductile iron housing segments to ASTM A536, grade 65-45-12; pressure responsive elastomer gasket; and ASTM A449 compliant bolts and nuts.

- Rigid Type: Housings cast with offsetting, angle-pattern, bolt pads to provide system rigidity and support and hanging in accordance with NFPA-13, fully installed at visual pad-to-pad offset contact. (Couplings that require exact gapping at specific torque ratings are not permitted.) Installation-Ready for complete installation without field disassembly. Basis of Design: Victaulic Style 107N and 009-EZ.
- Flexible Type: For use in locations where vibration attenuation and stress relief are required: Basis of Design: Victaulic Installation-Ready Style 177 or Style 77.

4.14 Do not route sprinkler piping (including drops) directly above any light fixtures. Do not route sprinkler piping near ceiling; hold tight to structure. Where large volumes occur above ceiling

route pipe at least 36” above ceiling. The Sprinkler Contractor shall coordinate during design of sprinkler systems to ensure these requirements are met.

4.15 SPRINKLER HEADS: Victaulic, Gem, Grinnell, Star, Viking, Reliable, Tyco: All sprinkler heads shall be fed in a reverse bend arrangement. Sprinkler head degree ratings shall be determined by the area serviced in accord with current Codes and Standard Practices.

4.15.1 Sprinklers shall be glass bulb type, with hex shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation.

4.15.2 Wrenches shall be provided by the sprinkler manufacturer that directly engage the hex-shaped wrench boss integrally cast in the sprinkler body.

4.15.3 Contractor shall be responsible to match sprinkler type within existing compartments as needed. Standard response and quick response sprinklers shall not be installed in the same compartment as defined by NFPA 13.

4.15.4 Types of sprinkler heads shall be as follows:

- Upright, Quick Response – Reliable (or equal) Model F1FR or Victaulic Model V27 Vertical Upright automatic sprinkler head.
- Sidewall, Quick Response – Reliable (or equal) Model GFR or Victaulic Model V27, horizontal sidewall automatic sprinkler head.
- Concealed, Quick Response – Reliable (or equal) Model G4A or Victaulic Model V38, Concealed automatic sprinkler head. Cover shall be white.

4.16 At the Contractor’s option, extended coverage sprinkler heads may be used where appropriate.

4.17 At the Contractor’s option, code approved flexible sprinkler heads may be used where appropriate and in compliance with the installation requirements of these specifications.

4.17.1 In lieu of rigid pipe offsets or return bends for sprinkler drops, the Victaulic VicFlex™ Multiple-Use Flexible Stainless Steel Sprinkler Drop System [with captured coupling Style 108] may be used to locate sprinklers as required by final finished ceiling tiles and walls. The drop system shall consist of a braided type 304 stainless steel flexible tube, zinc plated steel Male threaded nipple or Victaulic FireLock IGS Groove Style 108 coupling for connection to branch-line piping, and a zinc plated steel reducer with a female thread for connection to the sprinkler head.

4.17.2 The drop shall include a UL approved Series AH1 with 3” bend radius; AH2 or AH2-CC braided hose with a bend radius to 2” to allow for proper installation in confined spaces.

4.17.3 Union joints shall be provided for ease of installation.

4.17.4 The flexible drop shall attach to the ceiling grid using a one-piece open gate Series AB1 or AB2 bracket. The bracket shall allow installation before the ceiling tile is in place.

4.17.5 The braided drop system is UL listed for sprinkler services to 175 psi (1206 kPa) and FM Approved to 200 psi (1380 kPa).

4.18 When working in existing facilities, sprinkler heads style and color shall match existing.

4.19 Where sprinkler heads are installed in a tile ceiling, they shall be installed in the middle of the tiles, at half or quarter points along the length of the tiles.

4.20 Coordinate sprinkler head locations in kitchen freezer/cooler units with light fixtures and other ceiling mounted devices to ensure proper coverage is maintained. Provide these heads with cages. Seal freezer/cooler panels where pipe penetrations occur.

4.21 CLAMPS AND ANCHORS: Furnish and install approved clamps, as required, at all (45 degree) l/8 bends, (90 degree) ¼ bends and flange and spigot pieces to the straight pipe to ensure permanent anchorage of all fire lines. Fittings, clamps, clamp rods, nuts, washers, and glands shall be factory zinc coated.

4.22 HANGERS: All piping shall be adequately and permanently supported in an approved manner on approved hangers. Minimally support piping on 8 foot intervals for pipe 3” and smaller; 10 foot intervals for larger piping. Also support within 24” of changes in direction and end of runs. Reference Specification Section 202500 for additional information.

4.23 SLEEVES AND ESCUTCHEON PLATES: Furnish and install sleeves for pipes where piping penetrates masonry walls; exterior wall sleeves to be watertight. Fire and smoke stop all penetrations through fire and smoke walls and coordinate with General Contractor for locations. Furnish and install cast brass chrome plated split ring type escutcheons where piping penetrates walls, ceilings, and floors, whether in finished areas or not.

4.24 INSPECTION TEST CONNECTIONS & PRESSURE GAUGES: A 1" inspection test connection as required by the Building Code. Discharge shall run to open air. Control valve for test connection shall be installed not over 7' above the floor. A pressure gauge at the inspection. Test connection at each location indicated on the Plans. Pressure gauges shall be 2½" diameter and readable from the floor.

4.25 SIGNS: Appropriate code approved and required signs shall be installed on all control valves, drains, inspector's test, etc., indicating the function, installation, etc. Signs shall be neatly affixed with rust inhibitive screws, rivets or where hung from piping; with stainless steel No. 14 AWG wire.

4.26 FIRE HYDRANT: Furnish and install fire hydrants as approved by local Fire Department.

PART 5 – SYSTEM DRAINAGE:

5.1 The entire System except that part which is below grade and will not freeze shall be installed so as to allow 100% drainage.

5.2 All sprinkler branch piping shall be installed so as to drain back to the main riser.

5.3 Approved 2" drawoff piping shall be provided on sprinkler risers with discharge piping running to nearest floor drain or open air.

5.4 Where sprinkler piping is trapped, an approved auxiliary draw-off shall be provided and neatly installed.

5.5 All draw-offs shall have a metal tag labeled "Sprinkler Drain".

PART 6 – INSPECTIONS AND TESTS:

6.1 Furnish all labor, equipment and conduct all required tests in the presence of the Owner and Engineer or designated representative if requested. Coordinate with Owner and Engineer prior to testing.

6.2 All interior and exterior piping and devices comprising the fire protection system shall be tested under hydrostatic pressure of not less than 200 PSI and maintained for not less than two (2) hours. Any leaks or cracks developing as a result of these tests shall be repaired to the satisfaction of the Owner.

6.3 Upon completion of their work, the Contractor shall submit a written and signed certificate to the Engineer indicating that they performed the above prescribed tests and rectified all malfunctions arising therefrom.

END OF SECTION 210100

SECTION 220100 - PLUMBING SPECIALTIES

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 The Contractor shall provide all equipment and specialties complete with trim required and connect in a manner conforming to the State Plumbing Code.

1.3 The Contractor shall obtain exact centerline rough-in dimensions between partitions, walls, etc. as required for lay-out of the rough-in work. All work shall be roughed-in so that all exposed piping will be straight and true without bends or offsets.

1.4 All equipment and specialties shall be new. All equipment and specialties shall be installed as recommended by the manufacturer.

1.5 Prior to final inspection, test by operation at least twice, all equipment. Also, remove all stick-on labels, dirt, grease, other removable stampings, lettering, etc. from equipment and specialties and thoroughly clean same.

1.6 All equipment and specialties shall be installed in a neat and workmanlike manner. Unacceptable workmanship shall be removed and replaced at the installing Contractor's cost.

1.7 Provide all drainage specialties indicated, specified and/or required to provide complete and acceptable removal of all storm, sanitary, waste, laboratory waste, etc. from the building and into approved receptors. Drainage specialties shall be on non-electrolytic conduction to the material to which they are connected. Drainage specialties shall be installed in a manner to ensure no leakage of toxic or odorous gases or liquids and shall have traps and/or backflow preventers where required. Nor shall they allow backflow into other or existing systems.

PART 2 - CLEANOUTS:

2.1 CLEANOUTS: In addition to cleanouts indicated on the drawings, provide cleanouts in soil and waste piping and storm drainage at the following minimum locations:

- At base of each stack.
- At fifty (50) foot maximum intervals in horizontal lines.
- At each change of direction of a horizontal line.
- As required to permit rodding of entire system.
- As required by current State Plumbing/Building Codes.

2.2 Water closets, mop sinks/basins and other fixtures with fixed traps shall not be accepted as cleanouts.

2.3 Cleanouts and/or test tees concealed in inaccessible pipe spaces, walls and other locations shall have an eight (8) inch by eight (8) inch (minimum) access panel or cover plates shall be set flush with finished floors and walls and shall be key or screwdriver operable.

2.4 Access panels for cleanouts shall be of the Zurn 1460 series or equivalent by Josam or Wade. Where they are not to receive paint, they shall be polished bronze unless otherwise indicated where they are to receive paint or other finishes.

2.5 Cleanouts and access panels shall be sized so as to permit the entry of a full sized rodding head capable of one hundred percent circumferential coverage of the line served.

2.6 Provide a non-hardening mixture of graphite and grease on threads of all screwed cleanouts during installation.

2.7 Do not install cleanouts against walls, partitions, etc. where rodding will be difficult or impossible. Extend past the obstruction.

2.8 In finished walls, floors, etc., ensure that cleanouts are installed flush with finished surfaces and, where required, grout or otherwise finish in a neat and workmanlike manner.

2.9 EXTERIOR CLEANOUTS (ECO): Provide exterior cleanouts where indicated for all sanitary and storm lines leaving the building within 5'-0" of building perimeter. Permanently locate all exterior cleanouts with 12"x12"x12" solid finished concrete marker slightly above grade in grass areas or flush in concrete or pavement areas. Label "CO". Zurn Z-1400-HD cleanout with tractor cover for exterior locations. Provide concrete supporting pad crowned to shed water.

2.10 Cleanouts shall be as manufactured by Zurn, Josam, Wade, Ancon, Jay R. Smith, similar to the following:

- Zurn Z-1440 or Z-1445 cleanout tee at base of exposed stack and at change in direction of exposed lines.
- Zurn Z-1440 cleanout or Z-1445-1 cleanout tee where stacks are concealed in finished walls.
- Zurn ZN-1400-T cleanout with scoriated top in finished concrete and masonry tile floors.
- Zurn ZN-1400-Tx cleanout with square recessed top for VCT and linoleum finished floors.
- Zurn ZN-1400-Z cleanout with round recessed top for poured floors.
- Mueller D-731 or D-714, Nibco, Flage or equivalent for cleanouts in copper waste with cover plates and/or access panels listed for other cleanouts.
- Threaded hex head type cleanouts of same materials as pipe for piping 2" and smaller.
- Zurn cleanout with round top with adjustable retainer for carpet area. Install flush with carpet.

PART 3 – FLOOR DRAINS:

3.1 FLOOR DRAINS: Provide floor drains at locations indicated and/or as required by State Plumbing/Building Codes. Install in a neat and workmanlike manner. Install floor drains in strict accordance with manufacturer's recommendations and the State Plumbing and Building Codes. Coordinate locations with General Contractor to ensure floor pitch to drain where required. Refer to trap primer detail(s) for where floor drains require trap primer connections. All detail indicated floor drains shall have trap primers by means of trap primer connections to the drain body, drain trap, or trap primer adapter, in accordance with the plumbing code.

3.2 Ensure by coordination with the General Contractor that spaces served with floor drains on all floors above the lowest level have a water seal extending at least three (3) inches from the floor. Also, for these locations, provide a 36"x36", four (4) pound sheet lead flashing sheet and clamping collar, or a 30 mil chlorinated polyethylene shower pan liner. Lead pans shall be given a heavy coat of asphaltum on bottom and sides before installation and a heavy coat on any exposed surfaces. After installation, provide one ply of fifteen (15) pound roofing felt beneath each pan.

3.3 The floor drains shall be Zurn, Josam, Smith, Wade, Watts Drainage, Ancon, similar to the following:

- FD-1 - Zurn, ZN-415 floor drain with 6"dia. nickel bronze strainer, Type "B", dura-coated cast iron body with bottom 3" outlet.
- FD-2 - Zurn, ZN-511 floor drain with 9"dia. nickel bronze strainer, dura-coated cast iron deep sump with 4" bottom outlet, seepage pan and sediment bucket.
- FD-3 - Zurn, ZN-511 floor drain with 9"dia. nickel bronze strainer, dura-coated cast iron deep sump with 4" bottom outlet, seepage pan and sediment bucket. Provide with trap primer connection.

3.4 EXTERIOR AREA DRAINS (AD-1): Zurn Z508 area drain, 9" diameter top drain, dura-coated cast iron body, 4" bottom outlet and sediment bucket.

PART 4 – ROOF DRAINS:

4.1 ROOF DRAINS: Provide roof drains at locations indicated within the Contract Documents. Install in a neat and workmanlike manner. Install roof drains in strict accordance with manufacturer's recommendations and the State Plumbing and Building Codes. Coordinate locations with General Contractor to ensure pitch to drain.

4.2 Provide roof drains with accessories as required to match roof construction. Provide watertight seal at the connection of the body to the dome, to prevent roof water from entering into the body.

4.3 Adjust all water level regulators for overflow roof drains in the field.

4.4 Locate downspout nozzles in locations as directed by the Architect.

4.5 The roof drains shall be Zurn, Josam, Smith, Wade, Watts Drainage, Ancon, similar to the following:

- RD-1 - Zurn ZC-100-DP 4” outlet roof drain, sump receiver, deck plate, cast iron dome strainer.
- OSD-1 – Zurn, ZARB-199-SS 6” outlet downspout nozzle. All rough bronze body, threaded inlet and decorative face of wall flange and outlet nozzle, with removable stainless steel screen.

PART 5 – FREEZEPROOF WALL HYDRANTS:

5.1 FREEZEPROOF WALL HYDRANTS: Provide code approved wall hydrants at each location indicated in a neat and workmanlike manner. Affix tight to walls and ensure that the feed piping is on the heated side of the building insulation blanket. Provide all water supply specialties indicated, specified and/or required for the complete installation. Install in accordance with the manufacturer's recommendations and the Building Code. Where required by the State Plumbing Code, install code approved vacuum breakers in each water supply specialty.

5.2 Wall hydrants shall be Zurn 1320 or equivalent, 3/4", with half-turn ceramic cartridge, encased, flush, non-freeze, anti-siphon, automatic draining wall hydrant with key lock and combination backflow preventer/vacuum breaker.

5.3 Mount all wall hydrants at least twenty (20) inches above finished exterior grade. Where this is not possible or practical, contact Engineer for direction.

5.4 Turn over for each hydrant, an operator key in an envelope labeled "Exterior Wall Hydrants" to Owner upon completion of the project. Where hydrants have lockable boxes, turn over an operator key for each in an envelope labeled "Exterior Wall Hydrant Locks” to Owner upon completion of project.

PART 6 – INTERIOR HOSE BIBBS AND DRAIN VALVES:

6.1 HOSE BIBBS AND DRAIN VALVES: Provide code approved hose bibbs and drain valves at each location indicated in a neat and workmanlike manner. Affix hose bibs tight to walls. Provide all water supply specialties indicated, specified and/or required for the complete installation. Install in accordance with the manufacturer's recommendations and the Building Code. Where required by the State Plumbing Code, install code approved vacuum breakers in each water supply specialty.

6.2 HOSE BIBBS (HB): Provide code approved hose bibbs with vacuum breakers and male threaded spouts at each location indicated on the drawings. The hose bibbs shall be Woodford Model 24 (or equal) with loose key handle polished chrome finish, brass construction. Hose bibbs shall be mounted at eighteen (18) inches above finished floor. Do not install hose bibbs in spaces which do not have floor drains. Provide recessed hose bibbs in toilet rooms with floor drains, Woodford Model B75. Locate adjacent to ADA water closet.

6.3 DRAIN VALVES: Install 3/4 inch bronze body drains, similar and equivalent to Nibco, No. 72 or 73, as indicated and at the following locations:

- At the low point and isolatable section of the plumbing system.
- At each low point and isolatable section of the hydronic system.
- At each isolatable pipe section.
- At each water heater.
- At each storage tank.
- At each boiler.
- At each heat pump.
- At each water-to-water unit.
- At each chiller.
- At each pump suction.
- Install a code approved vacuum breaker where installation on to domestic water system.

PART 7 – WATER HAMMER ARRESTORS (WHA):

7.1 WATER HAMMER ARRESTORS (WHA): Provide water hammer arrestors at each location indicated below and/or as required to eliminate hydrostatic on the domestic water system. Install in an accessible location and in a neat and workmanlike manner. Provide all water supply specialties indicated, specified and/or required for the complete installation. Install in accordance with the manufacturer's recommendations and the Building Code. Where required by the State Plumbing Code, install code approved vacuum breakers in each water supply specialty.

7.2 Water hammer arrestors shall be Zurn, Z-1700, Shoktrol, Smith, Josam, Wade or equivalent. Water hammer arrestors shall be stainless steel, bellows type. Field fabricated capped cylinders shall not be acceptable. Provide insulating unions where arrestors are of dissimilar material from the piping served (unless piping is non-conducting, such as ABS or PVC).

7.3 MULTIPLE FIXTURES – BRANCH LINE LESS THAN 20’ LONG: The preferred location for a Zurn Shoktrol is at the end of the branch line between the last two fixtures served when the branch lines do not exceed 20’ in length, from the start of the horizontal branch line to the last fixture supply on this line.

7.4 MULTIPLE FIXTURES – BRANCH LINE MORE THAN 20’ LONG: On branch lines over 20’ in length, use two Shoktrols whose capacities total the requirement of the branch. Locate one unit between the last and next to last fixture and the other unit approximately midway between the fixtures.

7.5 Provide at least one water hammer arrestor at all quick acting valve locations including:

- Clothes Washers – Type “A”
- Commercial Dishwashers – Type “B”
- Sterilizers – Type “B”
- Mop Basins, downstream of check valves – Type “A”
- Flush valve fixtures – Type “B”, each toilet room with 1-3 flush valve fixtures shall have its own Type “B” water hammer arrestor.

7.6 ARRESTOR SCHEDULE:

Mark	Zurn Model Z-1700	Fixture Units	P.D.I. Size
Type “A”	#100	1-11	A
Type “B”	#200	12-32	B
Type “C”	#300	33-60	C
Type “D”	#400	61-113	D

PART 8 - OTHER SPECIALTIES:

8.1 VACUUM BREAKERS AND BACK FLOW PREVENTERS: Where required by the Building Code, whether indicated or not, provide approved vacuum breakers or backflow preventers at the following locations.

- Where domestic water system connects to a limited area fire protection system.
- Where domestic water system connects to hydronic system.
- At any threaded hose tap on the domestic water system.
- At all mop basins, provide check valves to the hot and cold water supply upstream of the faucet.

8.2 ROOF FLASHINGS: All plumbing vents or other plumbing passing thru the roof shall be flashed as approved by the State Plumbing and Building Codes and as recommended by the roofing manufacturer and/or Contractor.

END OF SECTION 220100

SECTION 220200 - PLUMBING FIXTURES, FITTINGS AND TRIM

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, General Conditions-Mechanical and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 The Contractor shall provide all fixtures complete with trim required and connect in a manner conforming to the State Plumbing Code.

1.3 The Contractor shall obtain exact centerline rough-in dimensions between partitions, walls, etc. as required for lay-out of his rough-in work. All work shall be roughed-in so that all exposed piping will be straight and true without bends or offsets.

1.4 Water supplies shall connect through walls with stops and chrome plated escutcheons with set screws.

1.5 All exposed piping, stops, traps, tailpieces, etc. shall be code approved chrome plated brass unless otherwise indicated or specified.

1.6 All fittings, fixtures and trim shall be new unless otherwise indicated or specified. They shall also be of equivalent quality, dimensions, material, etc. as those specified.

1.7 Handicapped fixtures shall be mounted as recommended by the KBC and ADA.

1.8 All fixtures shall be mounted as recommended by the manufacturer unless otherwise indicated or specified and so as to be rigid to walls and floors. Pay particular attention to flush valves and bracket concealed portion to building structure during rough-in. Loose, shaky flush valves, lavatories, etc. shall not be acceptable.

1.9 Prior to final inspection open all faucets and allow to run for fifteen (15) minutes, then remove all faucet aerators and thoroughly clean until smooth flow is obtained.

1.10 Prior to final inspection, test by operation at least twice:

1.10.1 (Where applicable) adequate flow of hot and/or cold water at;

1.10.1.1 Shower Heads
1.10.1.2 All Faucets
1.10.1.3 Flush Valves and Tanks
1.10.1.4 Tub Drains
1.10.1.5 Hose Bibbs
1.10.1.6 Sill Cocks
1.10.1.7 All Other Valved Hot and/or Cold Water Openings In the Plumbing System
1.10.1.8 All toilet seats

1.11 Prior to final inspection, remove all stick-on labels, dirt, grease, other removable stampings, lettering, etc. from plumbing fixtures and thoroughly clean same.

1.12 All fixtures shall be set level and true and shall be grouted into finished walls, floors, etc. in a neat and workmanlike manner with an approved waterproof non-yellowing grout for such service.

1.13 Special Note for Handicap Grab Rails: Coordinate top of shower valves, flush valves, flush tank, etc., with location of grab rails as shown on the architectural plans. The Contractor shall install all items to allow for installation, removal, and service without removal of the grab bar.

1.14 Available Manufacturers: Subject to compliance with requirement's manufacturers offering plumbing fixtures and trim which may be incorporated in the work include, but are not limited to, the following:

1.14.1 Plumbing Fixtures - Water Closet, Lavatory, Urinal, and Janitorial Sinks

1.14.1.1 Acorn Engineering
1.14.1.2 Kohler Co.

1.14.2 Plumbing Trim

1.14.2.1 Zurn Co.
1.14.2.2 American Standard, U.S. Plumbing Products
1.14.2.3 Chicago Faucet Co.
1.14.2.4 Kohler Co.
1.14.2.5 Delta Co.
1.14.2.6 T&S Brass & Bronze Work Co.
1.14.2.7 Just Co.
1.14.2.8 Speakman Co.

1.14.3 Flush Valves

1.14.3.1 Sloan

1.14.4 Fixture Seats

1.14.4.1 Zurn Co.
1.14.4.2 Bemis Mfg. Co.
1.14.4.3 Church Seat Co.
1.14.4.4 Olsonite Corp., Olsonite

1.14.5 Service Sinks and Mop Basins

1.14.5.1 Acorn
1.14.5.2 Fiat Products
1.14.5.3 Kohler
1.14.5.4 American Standard

1.14.6 Stainless Steel Sink

1.14.6.1 Acorn
1.14.6.2 Elkay
1.14.6.3 Just Manufacturing

1.14.7 Fixture Carriers

1.14.7.1 Josam Mfg. Co.
1.14.7.2 Kohler Co.
1.14.7.3 Tyler Pipe
1.14.7.4 Zurn Industries
1.14.7.5 Wade

1.14.8 Water Coolers

1.14.8.1 Elkay
1.14.8.2 Haws
1.14.8.3 Sunroc
1.14.8.4 Oasis
1.14.8.5 Halsey Taylor
1.14.8.6 Acorn Aqua

PART 2 – SELECTION:

P-1 WATER CLOSET – FLUSH VALVE, WALL MOUNTED – STANDARD HEIGHT
Kohler Model K-4325-SS vitreous china, elongated rim, siphon action water closet. Provide 1½" top spud, solid plastic elongated seat with open front, extended back, and check hinge. Provide with concealed carrier. Equal to Zurn Z1201 & ZZ1202 Water closet flush valve shall be as follows:

- Hardwired automatic sensor flush valve to be Sloan Royal Model 111-ESS-XL HW with transformer. 1.28 GPF.

P-1A WATER CLOSET – FLUSH VALVE, WALL MOUNTED – ADA HEIGHT
Kohler Model K-4325-SS vitreous china, elongated rim, siphon action water closet. Provide 1½" top spud, solid plastic elongated seat with open front, extended back, and check hinge. Provide with concealed carrier. Equal to Zurn Z1201 & ZZ1202. Mount seat at 18" AFF. Install flush valve on "open" side of water closet. Water closet flush valve shall be as follows:

- Hardwired automatic sensor flush valve to be Sloan Royal Model 111-ESS-XL HW with transformer. 1.28 GPF.
- Coordinate flush valve and sensor with ADA grab bars

- Hardwired automatic sensor flush valve to be Sloan Royal Model 111-ESS-XL HW with transformer. 1.28 GPF.

P-1B WATER CLOSET – FLUSH VALVE, FLOOR MOUNTED – ADA HEIGHT
Kohler Model K-96053-B vitreous china, 10" rough in, elongated rim, siphon action water closet. Provide 1½" top spud, solid plastic elongated seat with open front, extended

back, and check hinge. Install flush valve on “open” side of water closet. Water closet flush valve shall be as follows:

- Hardwired automatic sensor flush valve to be Sloan Royal Model 111-ESS-XL HW with transformer. 1.28 GPF.
- Coordinate flush valve and sensor with ADA grab bars.

P-2A LAVATORY – WALL-HUNG, BACKSPLASH – ADA HEIGHT

Kohler Model K2032, 20”x18” vitreous china lavatory with backsplash, rectangular basin, splash lip, front overflow, and 4” center faucet holes. Provide with concealed arm support and wall carrier. Provide lavatory drain with integral perforated strainer, 3/8" angle rigid supplies with stops and P-trap. Provide with insulation on the supply lines and P-trap similar to Brocar “Trap Wrap” vinyl plastic covering per ADA standards. Lavatory trim shall be as follows:

- Hardwired sensor faucet shall be Zurn model Z6915-XL-N-HW6-CWB, transformer, deck mounted, 4” coverplate, field adjustable settings and 0.5 GPM vandal-resistant aerator. Furnish and install Wilkins model ZW3870 tempering mixing valve.

P-2B WASH FOUNTAIN

Sloan AER-DEC Integrated sink system Model AD-82000. Product to be fabricated out of Corian or quartz. Vandal resistant, ADA compliant, 0.5 GPM flow rate per station, all valving, water supplies, and waste connections are concealed inside the apron with access panel is removable only with a hex key. Unit to be provided with thermostatic mixing valve, control transformer, check stops and strainers, drain spud, flexible stainless steel supply hoses and locknut. Color to be selected by Architect. Provide a Kohler model K-T11837, 11843-NA hard wired faucets with transformer.

P-3 URINAL – WALL-HUNG – ADA HEIGHT

Kohler Model K-4991-ET vitreous china, wall-hung, .125 GPF urinal with 3/4” top spud and concealed wall hanger brackets. Mounting height shall be per ADA. Urinal flush valve shall be as follows:

- Hardwired automatic sensor flush valve to be Sloan Royal Optima Model 186-0.125 ESS HW with transformer.

P-3A URINAL - WALL-HUNG – STANDARD HEIGHT

Kohler Model K-4991-ET vitreous china, wall-hung, .125 GPF urinal with 3/4” top spud and concealed wall hanger brackets. Urinal flush valve shall be as follows:

- Hardwired automatic sensor flush valve to be Sloan Royal Optima Model 186-0.125 ESS HW with transformer.

P-4 SINGLE COMPARTMENT SINK – CLASSROOM – ADA COMPLIANT

Elkay DRKAD251740, ADA compliant, single compartment stainless steel sink, 25”x17”x4” deep, REAR CENTER DRAIN, 18 gauge with 1 hole faucet punching. Provide with grid strainer, 3/8” chrome supplies stops, tailpiece and P-trap, drain and escutcheons. Provide with trap wrap insulation on P-trap and water supplies. Sink trim shall be as follows:

- LK535GN05L2 Single swing faucet with 13” high fixed spout, ADA compliant, Furnish and install Wilkins model ZW3870 tempering mixing valve. Set at 90 f under counter. Provide with LK1141A push button bubbler with flexible guard and ADA compliant – 2.2 GPM.

P-5 DRINKING FOUNTAIN WITH BOTTLE FILLER – ADA AND STANDARD HEIGHT
Elkay model LZSTL8WSSP electric water cooler; 8.0 GPH of 50 deg F water at 90 deg F room temperature and 80 deg F entering water; stainless steel basin, 1/5 HP compressor; 115/1phase/60 HZ. Provide with non-metallic P-Trap per manufacturers specifications.

P-6 MOP BASIN
Fiat MSB-24 24, 24" x 24" 10" high molded stone mop service basin in #231 white drift color and #874, 3" drain, Provide Chicago Faucet model 897-CP faucet, #832-AA hose and hose bracket, #889-CC mop hanger and #E-77-AA vinyl bumperguard. Provide with MSG stainless steel wall guards. Provide check valves on the hot and cold water supplies to the faucet.

P-9A COLD WATER CONNECTION BOX
IPS Corporation Water-Tite mini round ice maker outlet box with integral water hammer arrestor and preloaded nails. Connect cold water supply line to water supply at adjacent sink. Field paint exposed portions of box to match adjacent wall surfaces.

END OF SECTION 220200

SECTION 230200 - HVAC EQUIPMENT

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 The Contractor shall provide in complete working order the heating, ventilation and air conditioning equipment located as indicated and installed, connected, and placed in operation in strict accordance with the manufacturer's recommendations. All equipment shall be factory painted and, where applicable, factory insulated and shall, where such standards exist, bear the label of the Underwriters Laboratory.

1.3 All Contractors and Vendors providing a bid for this project shall review the Plans and Specifications and determine any modifications and/or adjustments necessary relative to the proposed equipment and materials with specific manufacturer's installation requirements. Include in the bid any necessary installation methods, features, options, accessories, etc. necessary to install the proposed equipment and materials, regardless of whether used as basis of design or being offered as a substitution in accordance with the specific manufacturer's installation requirements whether specifically detailed or not within the Plans and Specifications.

1.4 All equipment, material and labor warranties shall be furnished by the equipment supplier/vendor. All warranties begin on the date of Substantial Completion. Refer to Specification Section GENERAL PROVISIONS – MECHANICAL for special warranty requirements.

1.5 Refer to Specification Section GENERAL PROVISIONS – MECHANICAL for minimum required Schedule of Values breakdown.

1.6 Review the Specification Section – REQUIRED SHOP DRAWINGS, ETC., and provide all documentations called for therein.

1.7 Each subcontractor shall be responsible for their own completion of System Verification Checklists/Manufacturer's Checklists. Refer to Specification Section GENERAL PROVISIONS – MECHANICAL for additional requirements. Factory startup is required for all HVAC equipment. In general, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians and shall complete and submit start-up reports/checklists. This shall include the following:

- Heat Pumps
- Variable Frequency Drives
- Split Systems
- Packaged Rooftop Units
- Kitchen Rangehood, Make-Up Air Units and Exhaust Fans

1.8 All HVAC equipment shall comply with the latest provisions of ASHRAE Standard 90.1 and all provisions of the International Energy Conservation Code.

1.9 Ensure that the equipment that is proposed to be furnish may be installed, connected, placed in operation, and easily maintained at the location and in the space allocated for it.

1.10 The contractor and vendor shall confirm connection sides for each piece of equipment specific to this project.

1.11 Determine from the Bid Documents the date of completion of this project and ensure that equipment delivery schedules can be met so as to allow this completion date to be met.

1.12 Through coordination with other Contractors, Vendors and Suppliers associated with this Project, this Contractor shall ensure a complete, 100% functional, tested, inspected, and approved systems. Claims for additional cost or change orders will immediately be rejected. Refer to Specification Section - ELECTRIC MOTORS, ETC. for additional requirements. All equipment shall be furnished for a single point electrical connection unless specifically excluded as a requirement.

1.13 Review the Specification Section - CONTROLS to determine controls, including variable frequency drives, to be furnished. Where manufacturer's temperature controls are specified, they shall be in full compliance with NFPA 90A including automatic smoke shut down provisions.

1.14 Review the Specification Section – TESTING, BALANCING, LUBRICATION AND ADJUSTMENTS. For all belt driven equipment, provide final fan and motor sheaves as determined by the air balance contractor during project balancing phase. The mechanical contractor shall install any new sheaves and belts as required for balancing.

PART 2 – WATER SOURCE HEAT PUMPS – TOWER/BOILER SYSTEM:

2.1 ACCEPTABLE MANUFACTURERS: JCI/York, McQuay, Climate Master, Trane, FHP, Mammoth, Waterfurnas.

2.2 A 100% complete mockup installation shall be required for a typical unit. This mockup shall be inspected/reviewed by the Engineer prior to installation of other units.

2.3 Any mechanical closet dimension modifications or access requirements due to the manufacturer specifics shall be the burden of the approved manufacturer.

2.4 Equipment shall be specifically designed for applications within conditioned interior areas. Capacities shall be rated in accordance with ARI for tower/boiler applications. Equipment shall be ETL or CSA approved. All equipment shall have decals and labels to aid in servicing and indicate caution areas.

2.5 Equipment shall be completely factory assembled and tested, piped, internally wired and fully charged with Refrigerant R-410A. Threaded female water inlet and outlet connections, threaded female condensate connection, duct collars and all safety controls shall be furnished and factory installed.

2.6 A terminal block with screw terminals shall be provided for control wiring. A condensate overflow device shall be factory installed to stop compressor operation if drain pan overflow is imminent. An energy management relay to allow unit control by an external source shall be factory installed.

2.7 Refer to Specification Section GENERAL PROVISIONS – MECHANICAL for special warranty requirements.

2.8 CASING AND CABINET: The cabinet shall be constructed of galvanized steel and factory painted with ½" fiberglass on interior, discharge duct collar and return collar. Lift-out removable access panels shall be provided for access to the compressor and blower assembly compartments.

2.9 DRAIN PAN: The drain pan shall be constructed of stainless steel and insulated to prevent sweating. The bottom of the drain pan shall be sloped on two planes which will direct the condensate to the drain connection. When the unit is installed per the manufacturer's instructions, the drain pan shall be tested as follows: (1) Temporarily plug the drain pan, (2) fill the drain pan with 2" of water or the maximum allowed by the drain pan depth, whichever is

smaller, (3) remove the temporary plug and verify the drain pan removes the water within 3 minutes.

2.10 COMPRESSOR: The compressor or compressors shall be high-efficiency, hermetically sealed scroll type with internal vibration isolation. Compressors motors shall be equipped with overload protection. Refer to the drawing schedules as multiple compressor types shall be utilized.

2.11 COMPRESSOR SOFT START: The compressors shall be furnished with a soft-start feature for reduced startup inrush amps by 8:1 when compared to normal LRA.

2.12 AIR-TO-REFRIGERANT HEAT EXCHANGER: The air-to-refrigerant heat exchanger shall be constructed of staggered copper tubes with die formed corrugated aluminum fins mechanically bonded to the tubes. The air-to-refrigerant heat exchanger shall have a working pressure rating of 400 PSIG. Multiple compressor equipment shall provide a single air-to-refrigerant heat exchanger for each compressor.

2.13 WATER-TO-REFRIGERANT HEAT EXCHANGER: The water-to-refrigerant heat exchanger shall be of a high quality co-axial coil for maximum heat transfer. The copper coil shall be fluted to enhance heat transfer and minimize fouling and scaling. The coil shall have a working pressure of 600 psig on the refrigerant side and 400 psig on the water side.

2.14 REVERSING VALVE: The reversing valve shall be a pilot operated sliding piston type with replaceable encapsulated magnetic coil. The reversing valve shall be energized in the cooling cycle.

2.15 REFRIGERANT TUBING: Refrigerant tubing shall be constructed of copper. All low temperature refrigerant lines shall be insulated with an elastomeric insulation that has a 3/8" thick wall, flame spread rating of less than 25 and smoke density rating of less than 50, as tested in accordance with ASTM-84. The elastomeric insulation shall have a UL 94V-5 rating.

2.16 REFRIGERANT METERING: The equipment shall be provided with a thermal expansion valve. This device shall allow operation of the equipment in the range of 50 to 110º F entering fluid temperatures and 40 to 95º F entering air temperatures. The equipment shall only operate with one variable (enter water temperature, entering air temperature, cfm or gpm) at an extreme condition. All other variables must be within the nominal range of operation.

2.17 REFRIGERANT SYSTEM SERVICE ACCESS: The equipment shall be provided with factory supplied high and low pressure Schrader ports for easy refrigerant pressure or temperature testing.

2.18 BLOWER AND MOTOR ASSEMBLY: See Schedules for motor type. The motor shall have permanently lubricated and sealed bearings. All motors shall have internal thermal overload protection. The fan assembly shall be arranged for back, left, or right discharge. The discharge must also be capable of being changed in the field. Removal of the motor and fan wheel shall be made with the assistance of a factory provided orifice ring assembly. This assembly shall attach the wheel and motor to the fan housing providing single service access. Where available, provide one hand-held motor programming module to the Owner to utilize for startup and test and balance.

2.19 UNIT CONTROLS – SAFETIES: A factory tested and installed control box shall contain all necessary devices to allow heating and cooling operation of the equipment to occur. These devices shall be as follows:

2.19.1 24 Vac, energy limiting class II transformer.

2.19.2 Blower motor controller shall be a 24 Vac relay.

2.19.3 Compressor controller shall be a 24 Vac contactor. All three-phase operated equipment shall have a contactor that interrupts all three-phases providing power to the compressor.

2.19.4 Electrically operated safety lockout relay. This device shall prevent operation and anti-short cycling of the compressor during adverse conditions of operation. This device may be reset by either a remote thermostat or momentary interruption of power.

2.19.5 High pressure switch shall protect the compressor against operation at refrigerant system pressures in excess of 395 PSIG.

2.19.6 Low pressure switch shall prevent compressor operation underneath low charge or catastrophic loss of charge situations.

2.20 AIR FILTER SYSTEM: The Contractor shall completely assemble an Air Filter System for each unit and install ready to use. Heat pumps 5 tons and smaller require one 24" X 24" air filter system (one 24 X 24 filter). Heat pumps 6 tons through 10 tons require one 48" X 24" air filter system (two 24 X 24 filters). Heat pumps larger than 10 tons require one 72" x 48" air filter system (Six 24 X 24 filters). See plans for sizes and quantities. Refer to Specification Section GENERAL PROVISIONS – MECHANICAL for Temporary Use of Equipment Requirements and filter quantities.

2.20.1 Side Access Filter Housing: Housings shall accommodate required quantity of 24" X 24" X 2" deep flat filters as noted above. Housings shall be factory assembled, have one hinged access door with quick access latches (operable without special tools), and be constructed on 18 gauge aluminized steel minimum.

2.20.2 Filters shall be 30% efficient Merv 8, pleated and disposable. Provide Flanders/FFI Pre Pleat 40, 24" x 24" x 2" thick or approved equal. The filter pressure drop shall be 0.28" at 500 fpm face velocity. Each filter shall consist of a non-woven cotton and synthetic fabric media, media support grid and enclosing frame. The filter shall be listed by Underwriters' Laboratories as Class 2.

2.21 HOSE KIT & PIPING PACKAGE: Hose kits and piping package shall be as scheduled on the drawings. Single piece hose kits shall be provided for hose kits that are 1-1/2" or less in size. Two piece hose kits shall be provided for hose kits that are 2" and larger in size. Hose kits shall be the pipe runout size, not heat pump connection sizes. No exceptions!

2.21.1 Provide a factory-assembled hose kit/piping package for supply and return connections for each heat pump. Kits may be mounted in any direction and shall not require straight sections of pipe either upstream or downstream for proper operation. All hoses shall be equipped with end connections at terminal unit and shall be 24" long. All end connections shall be either permanently crimped swivel ends or butt welded to carbon steel end fittings to meet stated pressure ratings. Operational temperature shall be rated from fluid freezing to 200 degrees F. Minimum burst pressure shall be four times the working pressure. Furnish with field flushing connection fitting. Up to 1-1/4" shall be reinforced, fire retardant EPDM rubber, bonded to the inside wall of braiding. 1 ½" and larger shall be a corrugated type 321 stainless steel tube.

2.21.2 Each supply side (water inlet) hose kit/piping package shall include a single piece Y - valve body for sizes up to 1-1/2" and shall be constructed of hot forged brass with threaded inlets and outlets. 2" and larger sizes shall be two-piece and constructed of ductile iron with threaded inlets and outlets. All valve bodies are suitable for a minimum of 400 PSIG working pressure. Include single pressure/temperature test ports for verifying the pressure differential and system temperature. Include full flow design ball valve with blow out stems for shut off. Strainer shall be Y-type configuration furnished with hose connector blow down valve. Strainer screen shall be

stainless steel mesh and easily accessible for cleaning without disconnecting hoses. All valves shall be labeled with flow direction, manufacturer and model number, unit tagging.

2.21.3 Each return side (water outlet) hose kit/piping package shall include a single piece Y - valve body for sizes up to 1-1/2" and shall be constructed of hot forged brass with threaded inlets and outlets. 2" and larger sizes shall be two-piece and constructed of ductile iron with threaded inlets and outlets. All valve bodies are suitable for a minimum of 400 PSIG working pressure. Include single pressure/temperature test ports for verifying the pressure differential and system temperature. Include full flow design ball valve with blow out proof stems for shut off. All valves shall be labeled with flow direction, manufacturer and model number, unit tagging. Include automatic flow control valves which shall be factory set to rated flow and shall automatically control the flow to within 10% of the rated value subject to the operating parameters of 2-80 psid, fluid freezing to 225°F, 2-7 fps. Also provide a three-wire, two-way, two-position control valve with actuator. Actuator shall be field installed by the TCC.

2.22 EQUIPMENT START-UP: Prior to utilization of equipment, start-up service shall be performed by factory authorized representative. Utilize startup sheets included in the Specification Section GENERAL PROVISIONS - MECHANICAL. Refer to Specification Section GENERAL PROVISIONS – MECHANICAL for additional requirements.

2.23 Provide eight (8) hours of onsite training for this system. All training shall occur after building completion. Systems shall function properly, and O&M staff shall be able to operate the system prior to turnover.

PART 3 – PACKAGED ROOFTOP UNITS:

3.1 ACCEPTABLE MANUFACTURERS: Lennox, Trane, Carrier, JCI/York.

3.2 Refer to Specification Section GENERAL PROVISIONS – MECHANICAL for special warranty requirements.

3.3 The contractor shall furnish and install packaged rooftop units as shown and scheduled on the contract documents. The units shall be installed in accordance with this specification and perform at the specified conditions as scheduled. Capacity ratings shall be based on ARI Standard. Units shall consist of insulated weather-tight casing with compressors, air-cooled condenser coil, condenser fans, evaporator coil, return-air filters, supply motors, and unit controls.

3.4 Units shall be 100% factory run tested and fully charged with R-410A. Units shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas. Units shall be convertible airflow design as manufactured. Wiring internal to the unit shall be colored and numbered for identification.

3.5 Comply with manufacturer's installation instructions for rigging, unloading, and transporting units. Protect units from physical damage. Leave factory-shipping covers in place until installation.

3.6 Furnish a complete spare set of fan motor drive belts and air filters for each unit.

3.7 Refer to drawings for all required options and accessories.

3.8 Cabinet: Galvanized steel, phosphatized, and finished with an air-dry paint coating with removable access panels. Structural members shall be 18 gauge with access doors and removable panels of minimum 20 gauge. Units cabinet surface shall be tested 1000 hours in salt spray test in compliance with ASTM B117. Cabinet construction shall allow for all service/ maintenance from one side of the unit. Cabinet top cover shall be one piece construction or where seams exits, it shall be double-hemmed and gasket-sealed.

3.9 Units base pan shall have a raised 1 1/8 inch high lip around the supply and return openings for water integrity. Provide openings through the base for power, control, and condensate. Coordinate with electrical contractor.

3.10 Insulation: Provide 1/2 inch thick fiberglass insulation with foil face on all exterior panels in contact with the return and conditioned air stream. All edges must be captured so that there is no insulation exposed in the air stream.

3.11 Access Panels: Water- and air-tight hinged panels with handles shall provide access to filters, heating section, return air fan section, supply air fan section, evaporator coil section, and unit control section.

3.12 Fans and Motors: Provide evaporator fan section with forward curved, double width, double inlet, centrifugal type fan. Provide self-aligning, grease lubricated, ball or sleeve bearings with permanent lubrication fittings. Provide units with belt driven supply fans with adjustable motor sheaves. All fan motors shall be permanently lubricated and have internal thermal overload protection. Outdoor fans shall be direct drive, statically and dynamically balanced, draw through in the vertical discharge position. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil. Provide ECM fan motors for 2-stage units.

3.13 Evaporator Coil: Provide configured aluminum fin surface mechanically bonded to copper tubing coil. Provide an independent expansion device for each refrigeration circuit. Factory pressure tested at 450 psig and leak tested at 200 psig. Provide factory installed thermal expansion valve (TXV) for each refrigerant circuit. Factory pressure tested at 450 psig and leak tested at 200 psig. Provide a removable, reversible, cleanable double sloped drain pan for base of evaporator coil constructed of PVC.

3.14 Hot Gas Reheat Coil: Provide configured aluminum fin surface mechanically bonded to copper tubing coil. Provide an independent expansion device for each refrigeration circuit. Factory pressure tested at 450 psig and leak tested at 200 psig. Provide factory installed thermal expansion valve (TXV) for each refrigerant circuit. Factory pressure tested at 450 psig and leak tested at 200 psig. Provide a removable, reversible, cleanable double sloped drain pan for base of evaporator coil constructed of PVC.

3.15 Condenser Section: Provide internally finned seamless copper tube mechanically bonded aluminum fins. Factory pressure test to 450 psig. Provide vertical discharge, direct drive fans with aluminum blades. Fans shall be statically balanced. Motors shall be permanently lubricated, with integral thermal overload protection in a weather tight casing.

3.16 Refrigeration System: Provide scroll compressor with direct drive operating at 3600 rpm. Provide two-stage compressors as scheduled. Integral centrifugal oil pump. Provide suction gas cooled motor with winding temperature limits and compressor overloads. Units shall have cooling capabilities down to 0 degree F where indicated. Provide each unit with refrigerant circuits factory-supplied completely piped with liquid line filter-drier, suction, and liquid line pressure ports. Provide reversing valve, discharge muffler, flow control check valve, and electronic adaptive demand defrost control on all units.

3.17 Natural Gas Heating: Refer to Drawings for equipment requirements. Heat exchanger shall be stainless steel. Heater shall be installed internal to unit cabinet. Heater shall be UL and CSA listed and approved.

3.18 Air Filters: Factory installed filters shall mount integral within the unit and shall be accessible through access panels. Provide 2 inch thick 30% efficient filters to be field installed.

3.19 Outdoor Air Section: Where indicated, provide a fully integrated, 100% modulating outside air economizer with unit return and barometric relief air dampers, minimum position setting, preset linkage, wiring harness with plug. Unit operation is through primary temperature controls that automatically modulate dampers to maintain space temperature conditions. Provide economizer with enthalpy control. Provide adjustable minimum position control located in the economizer section of the unit. Provide spring return motor for outside air damper closure during unit shutdown or power interruption.

3.20 Controls: Provide microprocessor unit-mounted DDC UNIT controller. This UCM shall perform all unit functions by making all heating, cooling, and ventilating decisions through resident software logic. Provide factory-installed indoor evaporator defrost control to prevent compressor slugging by interrupting compressor operation. Provide an anti-cycle timing and minimum on/off between stages timing in the microprocessor.

3.21 Economizer Controls - Compressor operation is integrated with economizer cycle to allow mechanical cooling when economizer is not adequate to satisfy zone requirements. Compressors are enabled if space temperature is recovering to cooling setpoint at a rate of less than 0.2 degrees per minute. Compressor low ambient lockout overrides this function.

3.22 Provide 115-volt convenience outlet disconnect, factory-installed and powered per NEC requirements.

3.23 Roof Curb: Provide each unit with 18” minimum of roof curb. Note that the roofs are currently under warranty and all work must be in accordance with the warranty requirements and by approved contractors.

3.24 Contractor shall verify that roof is ready to receive work and opening dimensions are as required.

3.25 Contractor shall verify that proper power supply is available.

3.26 Contractor shall install in accordance with manufacturer's instructions. Contractor to review installation manual prior to setting the unit and contact engineer if there are any discrepancies or deviation from the design.

3.27 Contractor shall mount units on factory built roof mounting frame providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.28 The contractor shall furnish manufacturer complete submittal wiring diagrams of the package unit as applicable for field maintenance and service.

3.29 EQUIPMENT START-UP: Prior to utilization of equipment, start-up service shall be performed by factory authorized representative. Utilize startup sheets provided by the manufacturer. Refer to Specification Section GENERAL PROVISIONS – MECHANICAL for additional requirements.

3.30 All training to occur after building completion. System shall function properly, and O&M staff shall be able to operate the system prior to turnover.

PART 4 – KITCHEN RANGE HOOD, MAKEUP AIR & EXHAUST SYSTEM:

4.1 ACCEPTABLE MANUFACTURERS: K-Tech, Greenheck, Captive-Aire or Halton.

4.2 The Contractor shall submit shop drawings for the kitchen range hood system(s) along with all required supporting documentation and review fees to the Department of Housing, Buildings and Construction.

4.3 Through coordination with other Contractors, Vendors and Suppliers associated with this Project, this Contractor shall ensure a complete, 100% functional, tested, inspected, and approved system. Claims for additional cost or change orders will immediately be rejected. Refer to Specification Section - ELECTRIC MOTORS, ETC. for additional requirements.

4.4 Hood shall be furnished and installed to comply with NFPA-96, IMC Chapter 5 and local/state regulating governing same. Refer to drawings for sizes, locations, etc.

4.5 Hoods shall all be constructed of 18 gauge, Type 304 stainless steel and Number 3 finish. Grind and polish all exposed welds. Joints other than welded will not be accepted. All joints shall be internally welded.

4.6 Hood shall be furnished complete with all required concentric ductwork, plenums, curbs and controls. The rangehood supply and exhaust duct collars shall each be provided. Provide 8" minimum between supply and exhaust collars.

4.7 Provide 16” minimum height insulated roof curb for rangehood exhaust fans. Provide 16” minimum height insulated roof curb for makeup air unit at discharge. Provide equipment rails flashed/counter-flashed into roofing system for rear and middle sections of makeup air unit. Coordinate roof curb requirements with roofing system.

4.8 Hoods shall be capable of providing up to 90% of the required make-up air tempered through discharge grilles in the face of the hood.

4.9 Hoods shall be equipped with vapor proof fluorescent light fixtures with an average lamp output of 15 watts per foot of hood. Light Fixtures shall be UL-listed, surface-mounted, with lenses sealed vaportight.

4.10 TYPE I EXHAUST HOODS – GREASE LADEN VAPORS: Weld all joints exposed to grease with continuous welds and make grease removal devices and makeup air diffusers easily accessible for cleaning. Hood(s) shall be listed and labeled, according to UL 710, by a testing agency acceptable to authorities having jurisdiction. Grease Removal Devices shall be removable, aluminum, filter/baffle grease filters. They shall be fabricated with a minimum of 0.0781-inch-(1.98-mm-) thick aluminum for filter frame and removable collection cup and trough. Exposed surfaces shall be pitched to drain to collection cup. Filters/baffles shall comply with UL 1046, “Grease Filters for Exhaust Ducts. Hood Discharge Plenums shall be Type 304 Stainless Steel Plenums at the vertical face of both hoods. Plenum shall cover entire face.

4.11 TYPE II EXHAUST HOODS – HEAT ONLY: Weld all joints with continuous welds and makeup air diffusers easily accessible for cleaning. Hood(s) shall be listed and labeled, according to UL 710, by a testing agency acceptable to authorities having jurisdiction. Removable perforated screen to be located at exhaust outlet. Hood Discharge Plenums shall be Type 304 Stainless Steel Plenums at the vertical face of both hoods. Plenum shall cover entire face.

4.12 EXHAUST FANS:

4.12.1 Acceptable Manufacturers: Twin City, Greenheck, Cook.

4.12.2 Units shall be UL 76 certified for grease removal and selected in conjunction with the hoods.

4.12.3 Provide with totally enclosed motor and grease box.

4.12.4 Disconnect Switch: Where scheduled, a NEMA 3R disconnect switch shall be supplied with wiring leading from the motor to the junction box (TEFC motors).

4.12.5 Accessories: 16" roof curb, curb hinge with retaining chain, and aluminum bird screen. Refer to the drawings for additional requirements.

4.12.6 Provide with four (4) sets of belts for the Owner's use upon Substantial Completion.

4.13 NATURAL GAS, INDIRECT-FIRED MAKEUP AIR UNIT:

4.13.1 Acceptable Manufacturers: K-Tech, DuoAire, Trane, Reznor, or Greenheck.

4.13.2 The roof mounted make-up air unit including all components, shall be fully factory built, assembled, tested, and wired in accordance with NEC #70. Complete housing constructed of 20 gauge aluminized steel painted with a weatherproof production enamel over a primed surface.

4.13.3 Centrifugal supply fan with forward curved blades and adjustable belt drive with motor, pulleys, and belts. Fans shall be statically and dynamically balanced with double inlet. An access interlock switch shall be installed in the blower compartment and will disengage the blower upon removing the service panel. An override shall be incorporated into the interlock switch for serviceability. Motorized inlet-air dampers shall be provided with all operating controls installed.

4.13.4 The heat exchanger shall be 20 gauge, type 321 stainless steel.

4.13.5 The indirect fired natural gas heating unit shall be furnished as an integral part of the make-up air unit. The heating unit will be factory fired, pre-tested and adjusted. A pre-wired heater control panel with all necessary control elements shall be an integral part of make-up air unit. Heating unit shall be ETL certified. Burner controls shall include stainless steel burner with a capability of 30:1 turndown ratio, gas modulating valve, flame safeguards, main operating valve, pilot safety shutoff, pressure regulator, manual main and pilot shutoff valve, adjustable pilot valve and proper safety valves. Burners to be individually removable. The pilot shall be accessible through an access plate without removing the burner drawer assembly. Natural vent units shall be provided with a vent cap designed for gravity venting. Each duct furnace shall be provided with a 24-volt high temperature limit switch, a (redundant) combination gas valve and a fan time delay relay. All units shall be provided with a solid-state ignition control system which ignites the intermittent pilot by spark during each cycle of operation. When pilot flame is proven, main burner valve opens to allow gas flow to the burners. Pilot and burners are extinguished during the off cycle.

4.13.6 For the makeup air unit, provide a factory wired control panel to the voltage specified, mounted in a weatherproof box, shall contain in addition to terminals and wiring for the above, magnetic starters with three leg overload and disconnect switches for supply and exhaust fans and control transformer. All electrical work shall be in accordance with system design and in strict adherence to NEC #70 and other applicable codes. Electrical cabinet shall be isolated from the air stream with a non-removable access panel interior to the outer service panel. Motor and control wiring shall be harnessed with terminal block connections. Provide with fan motor starter and power disconnect switch for the entire unit.

4.13.7 Air Filter: Filter section for supply air with bird screen. Cleanable, sized by the manufacturer, aluminum mesh filters shall be provided in an easy access housing and slipframe.

4.14 FIRE CONTROL SYSTEM: Furnish and install a fire control system for each Type I Exhaust Hood. This system shall be a wet chemical, pre-engineered, piped, fixed nozzle, cartridge operated, non-pressurized type. It shall be specifically UL listed for the hazard involved and installed in accordance with National Fire Protection Association Standard No. 96 latest revision, "Standard for the Installation of Equipment for the Removal of Smoke and Grease Laden Vapors from Commercial Cooking Equipment". The system shall also conform to all local and/or state codes and standards. The design of the fire control system shall be by the vendor and provide for protection for duct systems, grease removal devices and hoods. Cooking equipment such as ranges and steam kettle, which may be source of ignition of grease in hood or duct shall be protected. The system shall be capable of automatic (connected to a suitable listed system of detection and actuation) and manual mechanical operation. Install manual operator 48" maximum feet above floor where indicated on the plans. All components, including the pressure container and the remote emergency fire station, shall be furnished by the hood manufacturer, and installed by the contractor. Include equipment for the automatic shutdown of any electric heating equipment under the hood. Coordinate with Electrical/Fire Alarm Contractor.

4.15 CONTROLS: Provide a complete controls system for the range hoods, exhaust fans, and makeup air unit. This shall include all wiring between indoor and outdoor equipment, start/stopping of fans and other components. Unit shall be wired for a single point connection to a weatherproof control panel complete with all required controls, starters and fusing. Each motor shall have its own power disconnect. Refer to Controls Section 250400 for additional information

4.16 BALANCING: Hoods supply and exhaust fan shall have the final air balance supervised by factory authorized personnel to obtain maximum performance. Submit air balance report to engineer stating CFM of exhaust and supply fans.

4.17 EQUIPMENT START-UP: Prior to utilization of equipment, start-up service shall be performed by factory authorized representative. Refer to Specification Section GENERAL PROVISIONS – MECHANICAL for additional requirements.

4.18 DUCT LEAKAGE TESTING:

4.18.1 Prior to the Code Official Inspection(s), the Contractor and the Equipment Manufacturer shall perform a pre-test on all duct systems to include a flashlight test of the ductwork. Any deficiencies shall be corrected and re-tested prior to the formal inspection(s) by the Code Official.

4.19 HOOD PERFORMANCE TESTING:

4.19.1 Performance test(s) shall be conducted by the Contractor and witnessed by the Code Official upon completion and before final approval of the installation of the ventilation system serving the commercial kitchen appliances. The test(s) shall verify the rate of exhaust airflow and makeup airflow as required as well as the proper operation of the system. The Contractor shall be responsible to provide the necessary equipment and perform the test including 45 second white smoke candles. The test(s) shall emulate actual cooking conditions with all appliances in operation. The test(s) shall also include validation of the automatic controls systems. The Contractor, Owner, Architect, Engineer, Test and Balance Contractor and the Equipment Manufacturer shall all be present during the Code Official Inspection(s).

4.19.2 Prior to the Code Official Inspection(s), the Contractor and the Equipment Manufacturer shall perform pre-test(s) on all hood systems to include smoke bomb testing with 45 second white smoke candles. The pre-test(s) shall emulate actual cooking conditions with all appliances in operation. The test(s) shall also include validation of the automatic controls systems. Any deficiencies shall be corrected and re-tested prior to the formal inspection(s) by the Code Official.

4.20 All training to occur after building completion. System shall function properly, and O&M staff shall be able to operate the system prior to turnover.

END OF SECTION 230200

SECTION 23 0800 COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED WORK

A. Division 22 – Plumbing

B. Division 26 - Electrical

1.2 REFERENCES

A. Drawings and general provisions of contract, including general and supplementary conditions, general mechanical provisions, and Division-1 Specification sections, apply to work of this section.

B. ASHRAE Guideline 1—1996

C. ASHRAE Guideline 0—2005

D. ACG Commissioning Guideline — 2005

1.3 DESCRIPTION OF WORK

A. The purpose of the commissioning process is to provide the owner/operator of the facility with a high level of assurance that the mechanical systems have been installed in the prescribed matter and operate within the performance guidelines set in the Basis of Design Documents (BOD). The CA shall provide the owner with an unbiased, objective view of the system's installation, operation, and performance. This process is not intended to take away or reduce the responsibility of the design team or installing contractors to provide a finished product. Commissioning is intended to enhance the quality of system start-up and aid in the orderly transfer of systems for beneficial use by the owner. The CA will be a member of the construction team, administrating and coordinating commissioning activities with the design team, construction manager, subcontractors, manufacturers, and equipment suppliers.

B. The independent commissioning agent (CA) contracted directly with the owner for this project. This specification has been included for reference only to define contractors' responsibilities. Each contractor should review this procedure and include adequate time in their proposal. Performance Test results may be used in determining the start of the warranty period for HVAC systems and subsystems.

PART 2 - PRODUCTS

2.1 Not Used

PART 3 - EXECUTION

3.1 ROLES OF THE COMMISSIONING AUTHORITY

A. The primary point of responsibility is to inform the construction manager, the owner and design team on the status, integration, and performance of HVAC systems within the facility.

B. The CA shall function as a catalyst and initiator to disseminate information and assist the design and construction teams in implementing completion of the construction process. This shall include system verification, functional performance testing, and conformance with the intended design of each system. Services include documenting construction observations, verification, and functional performance testing, and documenting proper distribution of performance and operating information to the owner's O&M staff.

C. Assist the responsible parties to maintain a high-quality level of installation by meeting or exceeding prevailing standards and specifications.

D. The CA shall observe, and coordinate testing as required to assure system performance meets the design intent.

E. The CA shall document the results of the performance testing directly and/or assure that the appropriate technicians document testing. The CA shall approve standard forms to be used by all parties for consistency of approach and type of information to be recorded.

F. The CA shall provide technical expertise to oversee and verify the correction of deficiencies found during the commissioning process.

G. The CA is to remain an independent party with specific knowledge of the project. The CA shall investigate the scope and extent of the problem and facilitate communication to determine responsibilities by delineating specifications. The CA shall monitor resolution for conformance with design intent and prevailing industry standards.

H. The CA shall document the date of acceptance as determined by the construction manager, owner, and design team. System Verification Checklists and Functional Performance Test results may be used in determining the start of the warranty period for HVAC systems and subsystems.

I. The CA will review operating and maintenance materials for HVAC systems.

J. The CA will review phasing plans as provided by the CM relating to temporary use of HVAC equipment, O&M considerations, warranty issues, impact of construction sequencing on occupied areas, and interruption of services from the existing equipment.

3.2 SYSTEMS INCLUDED IN THE COMMISSIONING PROCESS

A. Rooftop Units

B. Heat Pumps

C. Exhaust Fans

D. DDC Control System

E. Kitchen Hoods and Make-up Air Units

F. Hydronic Water Pumps

3.3 HVAC COMMISSIONING PLAN

A. The Commissioning Team (CT) shall consist of key parties involved in design, construction and testing of this facility. It is necessary for each agency to appoint team members that will have long-term commitments to this project. Switching team members during the project will reduce the ability of the CT to provide continuity and acceptable results to the building owner. Team members must maintain an ongoing supervisory position on this project. One team member shall be provided by each of the parties listed below:
   1. Program Manager (PrM)
   2. Facilities Management Division (FMD)
   3. Commissioning Agent (CA)
   4. Design Team (DT)
   5. Construction Manager (CM)
   6. Mechanical Contractor (MC)
   7. Controls Contractor (CC)
   8. Test and Balance Contractor (TABC)
   9. Electrical Contractor (EC)

B. Basis of Design Document
   1. The Basis of Design Document (BOD) represents a composite of design drawings, project specifications, submittals, change orders and industry standards that describe the systems of this facility. References to design intent will be taken from these contract documents. The BOD is an evolving manuscript maintained by the design professional to track and incorporate design alterations that occur throughout the construction process. Any industry standards used for this project will be specifically noted when referenced.
   2. The CA will review the BOD documents for adequate commissioning provisions, functional performance, optimization of performance, accessibility, TAB provisions, and O&M considerations.

C. Commissioning Meetings
   1. Commissioning meetings will be held in conjunction with progress meetings as necessary. The CA will be on site for the CX meetings. Commissioning meetings will be used to address any problems that alter the design intent or affect the commissioning process. These meetings provide an open forum for exchange of ideas between contractors, vendors, designers, users and owners.

D. Resolution Tracking Forms (RTF)
   1. The use of Resolution Tracking Forms is a method employed by the CA to monitor and record problems, their causes, and solutions. The use of these lists promotes communication between the installing contractors, design team, commissioning agent, and owner, in order to expedite their resolution in a timely manner.
   2. The CA will regularly submit RTF's to the CT in order to document and resolve deficiencies as quickly as possible. The frequency of RTF submission will be adjusted as project conditions dictate.

E. System Verification Checklists (SVC) / Manufacturers' Checklists
   1. The MC will provide SVC's based on manufacturers start-up procedures. These tests should be provided for all systems and subsystems. See SYSTEMS INCLUDED IN THE COMMISSIONING PROCESS. Draft copies will be submitted to the CT for review and comment prior to placement on the job site. A master copy of the SVC's will be bound in a three-ring binder and placed on the job site for use by the installing contractors. No system will be started until the appropriate SVC's have been completed.

2. The CA will review the SVC for each piece of equipment prior to start-up. Equipment will be released for start-up only after these checklists have been completed by the installing contractor and reviewed by the CA.
3. The equipment manufacturers' checklists must also be reviewed by the CA prior to start-up. These lists must be completed by the installing contractor and reviewed by the CA before start-up can commence.

F. Start-Up
1. Start-up of major HVAC systems will be witnessed the CA. The appropriate contractors and/or manufacturer's representative will be required on site to perform start-up. No system will be started until the appropriate SVC's have been completed. No system will be started until the Manufacturer's checklists have been completed. Start-up will be performed according to the Manufacturer's recommended procedures. The CA will visit the site to review completeness of installation in conjunction with progress meetings prior to starting HVAC equipment.
2. CT members involved in installation, fabrication, manufacture, control, or design of equipment are required to be present at the time of start-up. A factory-authorized technician will be on site to start equipment when required by the specifications. This will minimize delays in bringing equipment on line and expedite acceptable functional performance in accordance with the BoD.

G. Controls Monitoring
1. Close monitoring of the Control Contractor's progress will promote efficient coordination of the TAB work. The CC will be expected to submit point-to-point checklists verifying that his work has been completed and all systems are ready for TAB work and Functional Performance Testing. Programming and graphics will be surveyed by the CA for completeness and conformance with the BoD and the owner's scheduling requirements.

H. TAB Monitoring
1. The preliminary TAB report set-up will be reviewed prior to HVAC equipment start-up, in order to assure that the final TAB report format and content is acceptable.
2. TAB work will be monitored so that any problems that prevent or hinder proper air and water balance can be addressed and corrected with minimal delays. By addressing these problems as quickly as possible, we can assure that functional performance testing and owner training will take place on schedule.
3. A pencil copy of the TAB report will be reviewed prior to submission of the final TAB report. A written review will be submitted to the TAB contractor and to the DT for their comments. A TAB report approved by the DT will be required before Functional Performance Testing can be carried out. The CA will visit the site during the TAB process in order to assist TABC and CC in the effective completion of their scope of work.

I. Functional Performance Tests (FPT)
1. The CA will write FPT's based on the respective sequence of operations. These tests will be created for systems and subsystems. See SYSTEMS INCLUDED IN THE COMMISSIONING PROCESS above.
2. Each major system will be tested. A random sample of each subsystem will be tested. This will be coordinated and witnessed by the CA and the owner's maintenance staff. Witnessing the FPT's will serve as a compliment to the O&M Training. No FPT's will be performed until the system and related subsystems have been started, the TAB report has been submitted and reviewed, and the completion of the control system has been documented through point-to-point checklists and other documentation.
3. The Functional Performance Tests shall include HVAC and related equipment.
4. AHU's will be tested in designed operating modes. Proper operation will be verified at minimum OA, maximum OA, automatic control, and other modes, if necessary, to achieve BOD conformance.

a. Variable Air Volume terminals with and without reheats will be tested at minimum and maximum temperature set points, and under automatic control. Intermediate settings will be tested as necessary.
b. Chilled water system will be tested in designed operating modes. Proper operation will be verified at minimum loads, maximum loads, waterside economizing mode, Manual control, automatic control, and other modes.
c. Hot water system will be tested.
d. EF's will be tested for conformance to BoD.
e. Hydronic pumps will be tested under relevant operating conditions.
f. Heat Exchangers will be tested under relevant operating conditions.
g. DDC control systems will be tested as necessary.
h. HVAC systems will be tested to assure that the building as an integrated system operates properly.
i. Trend verification of systems and subsystems shall be completed prior to start of functional performance testing. CA will provide trend format to CC and discuss trend requirements in CX meetings throughout the construction phase of project.

5. Deferred Testing
   a. If tests cannot be completed because of a deficiency outside the scope of the responsible contractor, the deficiencies shall be documented and reported to the Owner. Deficiencies shall be resolved and corrected by the appropriate parties and test rescheduled.
   b. Off-season mode testing will be implemented as necessary to assure conformance with the BoD. Installing contractors will be expected to participate as required by the project specifications.
6. Rescheduled Functional Performance Test
   a. During Functional Performance Testing period, it is assumed that the contractors will be complete with all checklists when the commissioning agents travel to site. If the work is not ready for commissioning when the commissioning personnel are on site, their time will be billed to the contractor as an additional fee.
   b. If the contractor has deficiencies that cannot be corrected at the time of the test, that part of the sequence will be retested at a later date. If the deficiency does not pass during the retest, the contractor will be billed for the commissioning personnel's return trip.

J. Building Turn-Over / Owner Orientation / User Training
1. The CA will oversee contractors prepare, coordinate and review O&M manuals, working closely with each contractor to achieve specificity and completeness.
2. The CA will review as-built drawings, working closely with each contractor to achieve specificity and completeness.
3. Owner training will be coordinated with the assistance of the CA. The training will be provided by the installing contractor, or manufacturer's representative, and witnessed by the CA. This training should include both classroom training and hands-on operational training. The owner may choose to videotape this training for future use. The CA will visit the site during the Turn-Over and Training period to assure that any on-going HVAC related problems are being addressed and corrected in a timely and efficient manner.
4. The CA will assist in the coordination of off-season testing, calibrating, and servicing as specified in the contract documents.

3.4 RESPONSIBILITIES OF TEAM MEMBERS

A. Construction Manager (CM)
1. Include commissioning requirements in the mechanical, electrical, and controls contracts, as well as other subcontracts, to assure full cooperation of all parties in the HVAC commissioning process.

2. Assure acceptable representation, with the means and authority to prepare and coordinate execution of the mechanical commissioning program as described in the contract documents.
3. Assure that the CA shall receive a copy of all construction documents, addenda, change orders and appropriate approved submittals and shop drawings for review and use in development of the commissioning plan.
4. Coordinate inclusion of commissioning activities in the construction schedule.
5. Facilitate resolution of deficiencies identified by observation or performance testing.
6. Involve CA in selection of the air balancing contractor.
7. Assist the CA in monitoring the duct leakage testing.

B. Mechanical Contractor (MC)
1. Each contractor in this division shall include in their quote the cost of participating in the commissioning process.
2. Include requirements for submittal data (including partial load data), O&M data, and training in each purchase order or sub-contract.
3. Assure cooperation and participation of specialty sub-contractors such as sheet metal, piping, refrigeration, water treatment, temperature controls, and TAB in commissioning activities.
4. Assure participation of major equipment manufacturers in appropriate startup, training, and testing activities.
5. Attend commissioning meetings scheduled by the CA.
6. Assist the CA in system verification and performance testing.
7. Prepare preliminary schedule for HVAC system inspections, O & M manual submission, training sessions, pipe, and duct system testing, flushing, and cleaning, equipment start-up, system verification, performance testing, and system completion for use by the CA. Update schedule as appropriate throughout the construction period.
8. Complete System Verification Checklists and manufacturer's pre-start checklists prior to scheduling startup of HVAC equipment.
9. Monitor and respond to Resolution Tracking Forms distributed by the CA in order to expedite corrective actions necessary to achieve design intent.
10. Notify the CA a minimum of two weeks in advance of scheduled system start-up.
11. Update drawings to as-built condition and review with the CA throughout the construction process.
12. Schedule vendor and subcontractor provided training sessions as required by project specifications.
13. Provide written notification that the following work has been completed in accordance with the project specifications, and that the equipment, systems and sub-systems are operating in accordance with design intent.
14. HVAC equipment including fans, air handling units, dehumidification units, ductwork, dampers, terminal devices, etc.
15. Fire detection and smoke detection devices furnished under other divisions as they affect the operation of the HVAC systems.
16. That BAS is functioning in accordance with design intent.
17. Participate in the Functional Performance Tests.
18. Participate in the off-season mode testing.
19. Participate in O&M Training as required by project specifications.
20. Provide a complete set of as-built drawings and O & M manuals for review. The CA shall review the as-built drawings and O&M manuals concurrently with the design team.

C. Test and Balance Contractor (TABC)
1. Include cost for commissioning requirements (participation) in the contract price.
2. Attend commissioning meetings scheduled by the CA.
3. Submit the TAB procedures and preliminary TAB report to the CA for review at least two weeks prior to beginning TAB work.
4. Notify the CA a minimum of two weeks in advance of scheduled TAB work.

5. Provide partial, preliminary TAB Reports by phase, by building section, by system, or as required by the CA.
6. Assist the CA in system verification and performance testing.
7. Monitor and respond to Resolution Tracking Forms distributed by the CA in order to expedite corrective actions necessary to achieve design intent.
8. Participate in verification of the TAB report, which will consist of repeating any selected measurement contained in the TAB report where required by the CA for verification or diagnostic purposes.
9. Participate in the Functional Performance Tests as required to achieve design intent.
10. Provide sound and vibration where required to assist in diagnosis of areas exhibiting unacceptable levels of noise or vibration.
11. Participate in the off-season mode testing as required to achieve design intent.
12. Participate in O&M Training as required by project specifications.

D. Temperature Control Contractor (TCC)
1. Include cost for commissioning requirements in the contract price.
2. Review control sequence and component selection for conformance with design intent.
3. Attend a submittal review meeting with the CA and Engineer to ensure clear understanding of scope of work and expectations.
4. Verify that specified safeties and interlocks have been selected.
5. Verify proper selection of control valves and actuators based on design parameters.
6. Verify proper selection of control dampers and actuators based on design parameters.
7. Verify that sensor selection conforms to design intent.
8. Attend commissioning meetings scheduled by the CA.
9. Provide the following submittals to the CA
10. Hardware and software submittals.
11. Control panel construction shop drawings.
12. Narrative description of control sequences for each HVAC system and subsystem.
13. Schematics showing all control points, sensor locations, point names, actuators, controllers and where necessary, points of access.
14. A list of all control points, including analog inputs, analog outputs, digital inputs, and digital outputs. Include the values of all parameters for each system point. Provide a separate list for each stand-alone control unit.
15. A complete listing of all software routines employed in operating the control system. Also provide a program narrative that describes the logic flow of the software and the functions of each routine and sub-routine. The narrative should also explain individual math or logic operations that are not clear from reading the software listing.
16. Hardware operation and maintenance manuals.
17. Application software and project applications code manuals.
18. Panel and equipment insert documents.
19. Assist CA with remote monitoring capabilities. Supply any software and/or hardware needed.
20.
21. Verify that specified interfaces provided by others are compatible with BAS hardware and software.
22. Coordinate installation and programming of BAS with construction and commissioning schedules.
23. Complete System Verification Checklists and manufacturer’s pre-start checklists prior to scheduling startup of HVAC equipment.
24. Provide control system technician to assist during equipment startup.
25. Monitor and respond to Resolution Tracking Forms distributed by the CA in order to expedite corrective actions necessary to achieve design intent.
26. Participate in the Functional Performance Tests as required by the project specifications.
27. Provide a control system technician to assist during verification and performance testing.
28. Provide system modifications to achieve system operation as defined by the design intent.

29. Provide support and coordination for TAB contractor. Provide all devices, such as portable operator terminals and all software for the TAB to use in completing TAB procedures.
30. Provide written notification that the TCC scope of work has been completed in accordance with the project specifications, and that the equipment, systems and sub-systems are operating in accordance with design intent, and that BAS is functioning in accordance with design intent.
31. Participate in the Functional Performance Tests as required to achieve design intent.
32. Participate in the off-season mode testing as required to achieve design intent.
33. Participate in O&M Training as required by project specifications. Include training on hardware operations and programming

END OF SECTION 230800

SECTION 231100 - REGISTERS, GRILLES, DIFFUSERS & LOUVERS

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

PART 2 – REGISTERS, GRILLES, AND DIFFUSERS:

2.1 Acceptable R, G & D manufacturers are Krueger, Price, Anemostat, Nailor Industries, Titus, and Tuttle & Bailey. Shop drawings shall identify and list all characteristics of each device exactly as scheduled herein. Finishes for specified devices shall be selected by the Architect. Factory color samples shall be submitted with shop drawings. Devices shall be white unless noted otherwise. Aluminized steel devices are not acceptable. Steel devices are not acceptable unless specifically noted otherwise.

2.2 Include with the shop drawings a room-by-room schedule indicating devices installed. Also note ceiling types and installations.

2.3 Refer to drawings for schedule.

END OF SECTION 231100

SECTION 231200 - SHEET METAL

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 This branch of the work includes all materials, labor and accessories for the fabrication and installation of all sheet metal work as shown on the drawings and/or as specified herein. Where construction methods for various items are not indicated on the drawings or specified herein, all such work shall be fabricated and installed in accordance with the recommended methods outlined in the latest edition of SMACNA's Duct Manual and Sheet Metal Construction for Low Velocity Ventilating and Air Conditioning Systems. All equipment furnished by manufacturers shall be installed in strict accord with their recommended methods.

1.3 Ductwork shall be constructed and installed per the latest edition of the International Mechanical Code.

1.4 Ductwork shall be kept clean at all times. Ductwork stored on the job site shall be placed a minimum of 4” above the floor and shall be completely covered in plastic. Installed ductwork shall be protected with plastic. Do not install the ductwork if the building is not “dried-in”. If this is required, the entire lengths of duct shall be covered in plastic to protect. The Owner/Engineer shall periodically inspect that these procedures are followed. If deemed unacceptable, the Contractor shall be required to clean the duct system utilizing a NADCA certified Contractor.

1.5 Prior to purchase and fabrication of ductwork (shop fabricated or manufactured), the Contractor shall coordinate installations with new and existing conditions. Notify the Engineer if there are any discrepancies for resolution.

1.6 For healthcare projects, provide a SMACNA duct cleanliness level “C” per the latest SMACNA standards.

PART 2 – LOW VELOCITY DUCTWORK:

2.1 Ductwork, plenums, and other appurtenances shall be constructed of one of the following: Steel sheets, zinc coated, Federal Specification 00-S-775, Type I, Class E & ASTM A93-59T with G-90 zinc coating. Aluminum alloy sheets 3003, Federal Specification AA-A-359, Temper H-14.

2.2 Ductwork, plenums, and other appurtenances shall be constructed of the materials of the minimum weights or gauges as required by the latest SMACNA 2” W.G. Standard or below table. When gauge thickness differs, the heavier gauge shall be selected. The below table shall serve as a minimum.

Round Diameter	Duct Gauge	Rectangular Width	Duct Gauge
3-12 Inches	26 Ga.	3-12 inches	26 Ga,
12-18 Inches	24 Ga.	13-30 inches	24 Ga.
19-28 Inches	22 Ga.	31-54 inches	22 Ga.
29-36 Inches	20 Ga.	55-84 inches	20 Ga.
37-52 Inches	18 Ga.	85 inches and up	18 Ga.

2.3 All ductwork connections, fittings, joints, etc., including longitudinal and transverse joints, seams and connections shall be sealed. Seal with high velocity, smooth-textured, water based duct

sealant. Sealant shall be UL 181B-M listed, UL 723 classified, NFPA 90A & 90B compliant, permanently flexible, non-flammable, and rated to 15” wg. Apply per manufacturer's recommendations. Contractors shall ensure no exposed sharp edges or burrs on ductwork.

2.4 Duct dimensions indicated are required inside clear dimensions. Plan duct layouts for adequate insulation and fitting clearance.

2.5 All angular turns shall be made with the radius of the center line of the duct equivalent to 1.5 times the width of the duct.

2.6 Cross-break all ducts where either cross sectional dimension is 18" or larger.

2.7 Ducts shall be hung by angles, rods, 18 ga. minimum straps, trapezes, etc., in accordance with SMACNA's recommended practices. Duct supports shall not exceed 12 ft intervals. There shall be no less than one set of hangers for each section of ductwork. Where ductwork contains filter sections, coils, fans or other equipment or items, such equipment or items shall be hung independently of ductwork with rods or angles. Do not suspend ducts from purlins or other weak structural members where no additional weight may be applied. If in doubt, consult the Structural Engineer.

2.8 Double turning vanes shall be installed in square turns and/or where indicated.

2.9 Provide a “high efficiency” type take-off with round damper (Flexmaster STOD-B03 or approved equal) for all round duct branches from a rectangular main to a GRD. Refer to the detail on the drawings for all installation requirements.

2.10 Air volume dampers shall be installed in each duct branch takeoffs and/or where indicated, whichever is more stringent. All such dampers shall be accessible without damage to finishes or insulation and shall be provided where required for proper system balance.

2.11 Unless otherwise dimensioned on the drawings, all diffusers, registers, and grilles shall be located aesthetically and symmetrically with respect to lighting, ceiling patterns, doors, masonry bond, etc. Locate all supply, return, and exhaust diffusers and grilles in the locations shown on the architectural reflected ceiling plan.

2.12 The interior surface of the ductwork connecting to return/exhaust air grilles shall be painted flat black. The ductwork shall be painted a minimum of 24" starting from the grille.

2.13 Provide approved flexible connectors at inlet and outlet of each item of heating and cooling equipment whether indicated or not. Install so as to facilitate removal of equipment as well as for vibration and noise control.

2.14 All fans and other vibrating equipment shall be suspended by independent vibration isolators.

2.15 Miscellaneous accessories such as test openings with covers, latches, hardware, locking devices, etc., shall be installed as recommended by SMACNA and/or as indicated. Test openings shall be placed at the inlet and discharge of all centrifugal fans, VAV boxes, fan sections of air handling units, at the end and middle of all main trunk ducts and where indicated. All such openings shall be readily accessible without damage to finishes.

2.16 Whether indicated or not, provide code approved, full sized fire dampers at all locations where ductwork penetrates fire rated walls. Fire stop rating shall meet or exceed the rating of the wall. Provide an approved access panel at each fire damper located and sized so as to allow hand reset of each fire dampers. All such fire dampers and access panels shall be readily accessible without damage to finishes. Refer to Architectural Plans for locations of fire rated walls. All access doors shall be 16"x16" or as high as ductwork permits and 16" in length.

2.17 The Contractor who installs the sheet metal shall furnish to the Air Balancing Contractor, a qualified person to assist in testing and balancing the system.

2.18 INSULATED FLEXIBLE AIR DUCT: Thermaflex G-KM or equal. Flexible air duct shall be two (2) inch thick fiberglass insulation with CPE liner permanently bonded to a coated spring steel wire helix supporting a fiberglass scrim and fiberglass insulating blanket. Flexible air duct shall be listed under UL Standard 181 as a Class I flexible air duct complying with NFPA 90A and 90B. Maximum flame spread = 25 and maximum smoke developed = 50. Minimum insulating value is R-6.0. Flexible duct shall be used only for GRD runouts, and no section shall be more than five feet in length.

2.19 FLEXIBLE CONNECTORS: Duro-Dyne, Ventfabrics, Inc., U.S. Rubber or equivalent; conforming to NFPA No. 90A; neoprene coated glass fabric; 20 oz. for low velocity ducts secured with snap lock.

2.20 TURNING VANES: Fabricated as recommended by SMACNA: noiseless when in place without mounting projections in ducts. All turning vanes shall be double blade type.

2.21 ACCESS DOORS IN DUCTWORK: Flexmaster TBSM, Air Balance, Vent Products or equal. Access doors for rectangular ducts shall be 16"x16" where possible. Otherwise install as large an access door as height permits by 16" in length. Door shall be 2” thick double-wall insulated with continuous hinge and cam lock. Provide in ducts where indicated or where required for servicing equipment whether indicated or not. Provide a hinged access door in duct adjacent to all fire, smoke and control dampers for the purpose of determining position. Access doors shall also be provided on each side of duct coils and downstream side of VAV boxes and CAV boxes.

2.22 ARCHITECTURAL ACCESS DOORS IN CEILINGS OR WALLS: Provide Kees D Panel, Cesco, Milcor or equal. Panels shall be 24”x24” in size and constructed with 16 gauge galvannealed steel for door and frame. Provide with primer finish to accept specified finish. Door shall include three (3) screwdriver operated cam latches and concealed continuous pivoting rod hinge. Door shall open 175 degrees. For masonry construction, furnish frames with adjustable metal masonry anchors. For fire rated units, provide manufacturer’s standard insulated flush panel/doors with continuous piano hinge and self-closing mechanism. The Contractor shall include all required access doors in the bid and shall coordinate with the General Contractor prior to the bid to ensure a complete project.

2.23 VOLUME DAMPERS (RECTANGULAR): Ruskin MD35 or Air Balance, Pottorff, rectangular volume dampers. Frames shall be 16 gauge galvanized steel. Blades shall be opposed blade 16 gauge galvanized steel with triple crimped blades on 6” centers. Linkage shall be concealed in jamb. Bearings shall be ½” nylon. Maximum single section size shall be 48" wide and 72" high. Provide with Ventfabrics 2" high elevated dial regulator to avoid damper handle from conflicting with duct insulation. Provide permanent mark on dial regulator to mark air balance point.

2.24 VOLUME DAMPERS (ROUND): Ruskin MDRS25 or Air Balance, Pottorff round volume dampers. Dampers shall be butterfly type consisting of circular blade mounted to axle. Frames shall be 20 gauge steel and 6" long. Damper blades shall be 20 gauge crimped galvanized steel. Axle shall be 3/8"x6” square plated steel. Bearing shall be 3/8” nylon. Provide with Ventfabrics 2" high elevated dial regulator to avoid damper handle from conflicting with duct insulation. Provide permanent mark on dial regulator to mark air balance point.

2.25 FIRE DAMPERS: Fire dampers shall be Ruskin 1BD2 1½ hour rating U-215B vertical 1½ hour rating or United Air Type U-255B for a 3 hour vertical rating. Other acceptable manufacturers are Air Balance or Pottorff. Fire dampers shall be constructed and tested in accordance with UL Safety Standard 555. Each fire damper shall have a 1½ or 3 hour fire protection rating as

required by fire wall. Damper shall have a 165 degrees F fusible link and shall include a UL label in accordance with established UL labeling procedures. Fire damper shall be equipped for vertical or horizontal installation as required by the location shown. Fire dampers shall be installed in wall and floor openings utilizing minimum 20 gauge steel sleeves, angles, other materials, practices required to provide an installation to that utilized by the manufacturer when dampers were tested at UL. Blade and frame thickness shall be a minimum of 24 gauge. Installation shall be in accordance with the damper manufacturer's instructions. The blades shall be out of the air stream. Provide an access door for fire damper reset at all fire damper locations. Provide factory supplied caulked sleeve, gauge as required to meet manufacturer UL installation requirements.

PART 4 – EXPOSED ROUND DUCTWORK:

4.1 Prior to purchase/shipment of the ductwork, manufacturer shall provide as part of the submittal process scaled, field coordinated Autocad drawings of the complete system to be furnished. Drawings will indicate all system components including fittings, ductwork, and manifolds. Drawings shall be available in an electronic format.

4.2 Furnish and install where indicated double wall duct. The double wall duct shall be Eastern Sheet Metal, United McGill, Semco or approved equivalent. The duct shall have an inner shell, a 1-inch layer of fiberglass insulation and an outer pressure shell.

4.3 Ductwork outer shell shall be spiral, lock-seam construction fabricated from galvanized steel meeting ASTM-527 standard. Any ductwork exposed to view shall be constructed of G90 galvanized steel, 20 gauge, and shall be supported as required with aircraft cables and self-tightening locks. Exposed metal shall be prepped and cleaned prior to painting. Coordinate with General Contractor. Ductwork shall be constructed as specified in LOW VELOCITY DUCTWORK.

4.4 Inner shell for spiral pipe shall be 26 gauge solid galvanized steel, as noted on drawings. Ductwork shall have 3 intermediate reinforcing ribs and be constructed of the minimum gauge specified.

4.5 Inner shell for fittings shall be galvanized steel. All fittings shall be manufactured by the same manufacturer as the spiral pipe. Fittings shall be constructed a minimum of 22 Ga.

4.6 The fiberglass liner shall have a maximum thermal conductivity (k) factor of 0.27 btu per hour per square foot per degree Fahrenheit per inch thickness at 75 degree F ambient temperature.

4.7 All double wall ductwork will be furnished with factory installed flanges equal to Eastern Sheet Metal Flange which shall consist of a 1-1/2" outer flange and an inner secondary flange which shall keep the inner flange concentric and eliminate inner wall connections. Flanges requiring inner couplings will not be allowed, no insulation shall be exposed to the airstream at the connections.

4.8 All grille and register taps shall be factory manifolded. Field installed taps will not be allowed. Manifolded taps may be tack welded and caulked for appearance. Only taps for grilles and registers may be provided this way. All other fittings shall be full body welded.

PART 5 – KITCHEN RANGE HOOD EXHAUST DUCT:

5.1 Ducts shall be constructed of 18 gauge stainless steel with liquid tight continuous external weld of all seams and joints where exposed. Where ducts are concealed, they shall be constructed of 16 gauge carbon steel with liquid-tight continuous weld of all seams and joints. Inside laps on duct joints shall project in a direction against the air flow.

5.2 Ducts shall be so constructed and sloped as to provide suitable drainage of grease to a collection point.

5.3 Hand holes for inspection and cleaning purposes, equipped with tight fitting sliding or swinging doors and latches, shall be provided in horizontal sections of exhaust ducts. Such openings shall be at the sides of the horizontal run in order to prevent dripping of residue. Spacing of such openings shall not exceed 20 feet and shall be located at all offsets. Openings shall have a minimum dimension of 20" in width with a height equivalent to the duct height minus one inch.

5.4 At the base of each vertical riser, a residue trap shall be provided with provisions for cleanout.

5.5 The Contractor shall install the kitchen rangehood exhaust duct systems and maintain the minimum code required clearances to combustibles. The use of UL listed, and approved enclosure system of fire wraps/blankets installed per the manufacturer's instructions are acceptable when required to achieve the clearance to combustibles requirements.

5.6 At the Contractor's option, a UL2221 Pre-manufactured Duct System equal to Metal Fab 3G shall be acceptable. Duct shall have a stainless steel inner liner, aluminized outer liner and one or three inch liner as required to comply with requirements of clearance to combustibles.

5.7 Shop drawings of the kitchen rangehood exhaust ductwork shall be made and submitted to the appropriate reviewing agency. Any fees associated with this submittal shall be borne by this Contractor.

PART 6 – DISHWASHER EXHAUST DUCT:

6.1 All exposed exhaust duct shall be 22 gauge stainless steel duct with liquid tight continuous external weld of all seams and joints. All concealed exhaust duct shall be 24 gauge aluminum with liquid tight joints. Provide dielectric connection between steel and aluminum ductwork.

6.2 All ductwork shall be sloped so as to drain back toward the dishwasher.

PART 7 – WATER HEATER AND BOILER FLUE STACKS:

7.1 TYPE "B" GAS VENT SYSTEM

7.1.1 Metalfab Type "M", Ampco, or Metalbestos Type "B" gas vent system. Gas vent shall be double wall construction. Inner wall shall be aluminum and outer wall galvanized steel. One-half inch insulating air space shall be provided between the walls. Gas vent system shall be UL listed and installed in strict accordance with the manufacturer's recommendations. Provide with factory fittings such as elbows, tees, tee cap, cap, tall cone flashing, support plate increaser etc., as required for a complete project. Shop drawings shall be submitted for Engineer's review. Minimum UL listed clearance to combustibles shall be one inch.

PART 8 – DRYER VENT DUCTWORK

8.1 All dryer ducting shall be a minimum of 4" in diameter. Refer to the drawings for exact duct sizing.

8.2 Dryer vent ductwork shall be rigid metal 20-gauge aluminum duct. "Dryer ducts shall have a smooth interior finish and be supported at 4-foot intervals." Duct joints shall be installed so that the male end of the duct points in the direction of the airflow. Joints shall be secured with metal tape (not duct tape). Do not use rivets or screws in the joints or anywhere else in the duct as these will incur lint collection.

8.3 Length of concealed rigid metal ducting shall not exceed the allowable length of 35 feet. Deduct 5 feet from the allowable length for every 4" 90 degree elbow and 4" 2.5 feet for every 45 degree

fitting. These lengths may vary per local codes and dryer manufacturer's recommendations. Install per 2012 IMC Section 504 Clothes Dryer Exhaust. Provide a complete, working in-line booster fan system, including power, if the maximum allowable duct length is exceeded.

8.4 Flexible transition hose connection at the dryer shall be the aluminum flexible duct type. Do not use the plastic or vinyl.

8.5 Termination of dryer venting shall be to the exterior with a proper hood or roof jack equipped with a backdraft damper. Hood/jack shall be painted with suitable exterior grade paint and color per the Owner's direction. Small orifice metal screening shall not be part of the hood or roof jack as this will trap lint and block the opening. The hood opening shall point down and maintain a minimum of 12 inches of clearance between the bottom of the hood and the ground or other obstruction.

END OF SECTION 231200

SECTION 250100 - ELECTRIC MOTORS AND OTHER ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 Through coordination with other Contractors, Vendors and Suppliers associated with this Project, this Contractor shall ensure a complete, 100% functional, tested, inspected, and approved systems. Claims for additional cost or change orders will immediately be rejected. Refer to Specification Section – HVAC EQUIPMENT for additional requirements. All equipment shall be furnished for a single point electrical connection unless specifically excluded as a requirement.

1.3 Review the Specification Section - CONTROLS to determine controls, including variable frequency drives, to be furnished.

1.4 Prior to ordering any materials or rough-in of any kind, the Mechanical Contractor shall be responsible for final coordination of all electrical requirements (i.e., voltage, phase, circuit breaker, wire sizing, etc.) with the Electrical Contractor. There will be no change in the Contract Amount for any discrepancies. A final coordination meeting shall be held with the Architect, Owner, Engineer, General Contractor, Mechanical Contractor, Electrical Contractor, and their sub-contractors.

PART 2 – MOTORS:

2.1 The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications and drawing schedules.

2.2 Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.

2.3 Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.

2.4 Motors shall be capable of frequency of starts as indicated by automatic control system and not less than five (5) evenly time spaced starts per hour for manually controlled motors.

2.5 Motors shall have a 1.15 service factor for poly-phase motors and 1.35 service factor for single phase motors.

2.6 Motors shall have a temperature rating for 40 deg C ambient environment with maximum 90 deg C temperature rise for continuous duty at full load with 1.15 service factor and Class B insulation.

2.7 Unless otherwise noted or required by application, motors shall conform to NEMA Standard MG 1 (Table 12-10) for general purpose, continuous duty, horizontal, T-frame, single speed, design “A” or “B”. Utilize design "C" motors where required for high starting torque.

2.8 Motor frames shall be NEMA Standard No. 48 or 56. Use driven equipment (fans, pumps, etc.) manufacturer's standards to suit specific application.

2.9 Provide inverter rated motors where variable frequency drives are utilized. Motor shall be premium efficiency type with Class F insulation and shall conform to NEMA MG 1 parts 30 and

31. Inverter duty rated motors shall have a temperature rating for 40 deg C ambient environment with maximum of 105 deg C temperature rise.

2.10 Motor bearings shall be ball or roller bearings with inner and outer shaft seals. Bearings shall be re-greasable, except permanently sealed where motor is normally inaccessible for regular maintenance. Bearings shall be designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.

2.11 Motor enclosure type shall be open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation. Enclosures shall be guarded drip-proof type motors where exposed to contact by employees or building occupants. Enclosure shall be weather protected Type I for outdoor use or Type II where not housed.

2.12 Provide built-in thermal overload protection and, where required, internal sensing device suitable for signaling and stopping motor at starter.

2.13 Provide premium efficient motors with a minimum EPACT efficiency in accordance with NEMA MG 1, Table 12-11 and 12-12 for 1800 rpm, enclosed motors. If efficiency not specified, motors shall have a minimum efficiency as listed below:

1 hp - 85.5%	7.5 hp – 91.7%	30 hp – 93.6%
1.5 hp – 86.5%	10 hp – 91.7%	40 hp – 94.1%
2 hp – 86.5%	15 hp – 92.4%	50 hp – 94.5%
3 hp – 89.5%	20 hp – 93.0%	60 hp – 95.0%
5 hp – 89.5%	25 hp – 93.6%	75 hp – 95.4%

2.14 On the motor nameplate, indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

PART 3 – MOTOR STARTERS:

3.1 Provide motor starters where indicated on the mechanical equipment schedules or elsewhere in the Contract Documents.

3.2 Motor starters shall be NEMA style. Their sizing and installation shall be coordinated with the equipment manufacturer's requirements and in accordance with the National Electrical Code.

3.3 All starters shall be size 0 minimum. They shall be constructed and tested in accord with latest edition of NEMA standards. All starters shall be across-the-line magnetic type, unless indicated otherwise. On motors of 20 H.P. or greater rating, the supplier shall provide starters capable of limiting inrush currents. These shall be the reduced voltage open-transition type. Do not utilize closed transition starters unless specifically indicated.

3.4 Magnetic starters shall be furnished with the following characteristics and accessories as a minimum. See remaining paragraphs of the Part and mechanical schedules for further requirements.

3.5 Contacts shall be silver-alloy, double-break type except NEMA size 8 and 9 shall be single-break type. Contacts shall be replaceable without removal of wiring or removal of starter from enclosure. Number of contacts shall be as required for service indicated. Contacts shall be gravity dropout type, positive operation.

3.6 Coil voltage shall be 120 volts, A.C., 60 HZ or less, as required to suit control systems available voltages. Coils shall be of molded construction, except for size 8 and 9 which shall be hand wound. Provide coil clearing contact as required.

3.7 Provide control transformer of adequate K.V.A. as required on all starters with line-to-line voltages higher than 120 volts A.C. Provide fuse block and slow-blow fuse to protect control transformer per NEMA, N.E.C. and U.L.

3.8 Provide hand-off-auto selector switch in face of starter, wired into hand and off switch positions. Auto position (if needed) to be field wired as indicated for automatic control.

3.9 Provide NEMA Class 20 resetable overload relays, accurately sized to the motor nameplate rating of the motor served and the temperature differential between motor and controller. Overloads shall be easily replaceable, and resetable without opening enclosure, via a push button or similar means. Class 10 or Class 30 overloads may be used depending on type of motor duty encountered.

3.10 Provide at least one N.O. auxiliary contact (field-convertible to N.C. operation) with each starter. All starters shall have space for two additional single-pole contacts.

3.11 All starters shall be thru-wiring type.

3.12 Provide phase failure sensing relay to open starter coil circuit (on loss of one or more phases) on all three-phase starters controlling motors of 7½ H.P. or larger.

PART 4 – ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT:

4.1 All mechanical equipment shall be provided for single point electrical connection unless noted otherwise.

4.2 The equipment manufacturer shall provide internally mounted fuses with the equipment, as required, to comply with the U.L. listing on the equipment name plate. (i.e., hermetically sealed compressors or equipment with name plate data that recommends or requires fuse protection.) See also, National Electrical Code, Article 440, Part C, and other applicable sections of the N.E.C.

4.3 It shall be the Contractor's responsibility to assure that all mechanical equipment requiring electrical connections be provided with all required proper wiring, electrical protective devices, disconnecting means and electro-mechanical starting units to properly match the mechanical equipment requirement.

4.4 Each separate contractor engaged for the project shall coordinate with all other trades to ensure all necessary equipment and labor is included for fully functioning mechanical systems, installed per Code and Project requirements.

4.5 Refrigeration condensing units with internal compressors shall be furnished with integral starter.

4.6 All interlock or other control wiring, unless specifically noted otherwise, is the responsibility of this Contractor.

4.7 All equipment shall be suitably enclosed. All enclosures for equipment shall be rated and approved for the environment in which it operates. (i.e., NEMA 1, NEMA 3R, NEMA 7, NEMA 12, etc.) Verify the requirement with the installation condition if not indicated on the plans.

4.8 Observe the following standards for manufacture of equipment and in selection of components: (1) Starters, control devices and assemblies - NEMA (I.E.C. style not acceptable), (2) Enclosures for electrical equipment – NEMA, (3) Enclosed switches – NEMA, (4) All electrical work, generally NFPA 70, (5) All electrical work in industrial occupancies - J.I.C. standards, (6) All electrical components and materials - U.L. listing required.

4.9 Where scheduled on the drawings, provide disconnect switches and contactors. Disconnect switches shall be fusible type or circuit breaker type.

PART 5 – REQUIREMENTS FOR MECHANICAL EQUIPMENT 3/4 H.P. OR LESS:

5.1 This section describes requirements for small mechanical equipment such as (but not limited to) package terminal heating/cooling units, VAV boxes, unit heaters, unit ventilators, exhaust fans, fans, fan coil units, cabinet heaters, DDC temperature control panels, etc.

5.2 Small equipment with motor(s) of 3/4 H.P., single phase or less are generally not required to be furnished with starter(s), unless otherwise noted. For such equipment, provide integral contactor or horsepower-rated relay where controlled by thermostat or other type of switch. Contactors or relays shall be as recommended by the manufacturer of the equipment.

5.3 Provide transformer within unit as required to provide low voltage A.C. for thermostat control.

5.4 Provide internal fusing for unit motor and other loads in fuse block or in-line fuseholder.

5.5 Where externally-mounted disconnecting means is required and would be impractical, unsightly, or inappropriate in the judgment of the Engineer, disconnects shall be located within the unit. These disconnects may be fusible H.P.-rated snap switches or manual starters with overload elements, as required. Locate this and other electrical equipment within enclosure where easily accessible behind access panel or door on unit, and as acceptable to the electrical inspector or local authority having jurisdiction.

END OF SECTION 250100

SECTION 250400 - CONTROL - DIRECT DIGITAL

PART 1 – GENERAL:

1.1 The controls system for this project shall be a web-based digital controls system. All controllers, control interface hardware, services, installation, warranty, training, etc., shall be included as hereinafter specified. The system shall utilize a network controller and unitary" type controllers. Including such minor details not specifically mentioned or shown, as may be necessary for the complete operation of the system.

1.2 The Temperature Control Contractor (TCC) shall furnish all labor, materials, equipment, and service necessary for a complete and operating Building Automation System (BAS), utilizing Web Based Direct Digital Controls. All labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned shall be included for the complete, fully functional and commissioned temperature controls system.

1.3 The TCC shall provide all items, articles, materials, devices, operations, or methods listed, mentioned or scheduled on the drawings including all labor, materials, equipment and incidentals necessary and required for their completion to provide a complete and operating temperature control system. This will include connecting to any mechanical equipment furnished with a control interface device and contacting the equipment suppliers and/or manufacturers for information for the proper interface to the equipment being furnished.

1.4 These apparatus' shall consist of, but not limited to, all necessary thermostats, sensing devices, valves, automatic dampers, damper motors, actuators, (except automatic dampers, valves, and damper motors furnished with HVAC equipment), and with the necessary accessories for the complete control of all equipment hereinafter specified.

1.5 Control sequences are specified at the end of this section. Provide all control equipment required to perform sequences described. Coordinate all dampers with the sheet metal contractor and equipment provider. It is the responsibility of the control contractor to ensure all required dampers in the sequence of operations are provided.

1.6 Include all power wiring and cabling for the operation of the controls system. Refer to Electrical Division Specifications for additional requirements.

1.7 **BASE BID APPROVED MANUFACTURER'S: Reliable Controls by Automated Building Concepts, Inc., Trane, JCI and Siemens**. These TCCs/manufacturers have prior approval with the Owner and Engineer and are the only allowed suppliers and/or installing TCCs.

1.8 **ALTERNATE BID MANUFACTURER: Reliable Controls by Automated Building Concepts, Inc**. These TCCs/manufacturers have prior approval with the Owner and Engineer and are the only allowed suppliers and/or installing TCCs.

1.9 The TCC shall have an established working relationship with the control manufacturer of not less than five years and shall have prior approval from the Owner and Engineer and are the only allowed suppliers and/or installing contractors. The TCC shall have a local office within 100 miles of the project site and provide service and/or replacement parts within a 24 hour notification of a control failure.

1.10 A mandatory pre-installation meeting shall occur prior to the TCC beginning any work on site. This meeting shall be attended minimally the prime contractor, mechanical contractor superintendent,

TCC superintendent, Engineer, Owner, and Architect. The purpose of the meeting is to have the controls installer communicate their understanding of the system design and how the system is intended operate to the Engineer and get the Engineer's input and agreement. The agreement between the TCC and the mechanical engineer is to be thoroughly documented by the TCC for later reference.

1.11 The installation shall comply with the Local Authorities and State Fire Marshal code requirements, including normal operating and smoke mode functions (where applicable). The installation shall comply with the requirements of the NEC, NFPA, UL and the Building Codes, including referenced mechanical, electrical, energy codes, etc.

1.12 ABBREVIATIONS:

- TCC – Temperature Control Contractor

1.13 The TCC shall list the following cost breakdowns, material, and labor, on the official project schedule of values:

- Controls shop drawings
- Controls graphics
- Controls materials and labor
- Controls startup, commissioning, testing, documentation (2.5% of controls contract value)
- Controls training and Owner acceptance (2.5% of controls contract value)

PART 2 – GENERAL SYSTEM REQUIREMENTS:

2.1 All labeling for this system shall utilize actual final room names and numbers. The room names and numbers on the Contract Documents may not be the Owner's exact requirements. Coordinate with the Owner to compliance.

2.2 Include in the bid for the Controls Contractor to perform additional 40 on-site hours of on-site programming, adjustments, modifications, etc. as requested by the Engineer during the warranty period after the date of substantial completion for the project.

2.3 All points of user interface shall be on standard PCs that do not require the purchase of any special software from the control's manufacturer for use as a building operations terminal. The primary point of interface on these PCs will be a standard Web Browser.

2.4 The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system integrated utilizing ANSI/ASHRAE Standard 135-2001 BACNet, LONWorks technology, OBIX TCP/IP, MODBUS, OPC, and other open and proprietary communication protocols in one open, interoperable system

2.5 The TCC shall connect to any mechanical and electrical (power monitoring) equipment furnished with a control interface device. The TCC shall contact the equipment suppliers and/or manufacturers for information for the proper interface to the equipment being furnished. All points not provided with the equipment control interface are the responsibility of the TCC.

2.6 The operating system shall be based on a distributed control system in accordance with specifications. All building controllers, application controllers and all input/output devices shall communicate via BACnet MS/TP or LonMark/LonTalk communication protocol. Network controller shall communicate via BACnet over Ethernet (IP).

2.7 The TCC contractor shall provide access to the system from a location determined by the Owner and from the Consulting Engineer's office (CMTA, Inc.). This shall include remote access requirements, set-up, passwords, and any software necessary to access the BAS system.

2.8 The TCC shall all have access to various types of WEB browsers (i.e. Netscape, IE, etc.), which shall be included for access to the Direct Digital Control (DDC) system via the Owner's Wide Area Network (WAN) and/or Local Area Network (LAN).

2.9 The TCC shall be responsible for coordination with the Owner's IT staff to ensure that their system will perform in the Owner's environment without disruption to any of the other activities taking place on that WAN/LAN.

PART 3 – SPECIAL PROJECT REQUIREMENTS

3.1 Put any special requirements in this section such as allowances, existing conditions modifications, etc.

3.2 Owner's existing Facility Management Control System consists of a Reliable Controls BAS. The new BAS shall interface with the existing facilities Tracer ES Framework. It is the responsibility of the contractor to install and update the server with the existing buildings.

3.3 It will be the responsibility of the TCC to implement this project onto the Master WEB Supervisor Server with no damage to the existing projects. Any computer connected to the WAN, utilizing a web browser, and having the proper password shall be able to communicate with the Owner's DDC system.

3.4 If TCC needs to update or revise any of the existing software, to allow their software to operate seamlessly with the owners existing server, it will be completed by the TCC as a part of this contract.

3.5 If the existing building head end software needs to be updated or revised to communicate with TCC's software, it is to be completed by the TCC as a part of the bid.

3.6 All new software, graphics, terminology, operation, trending, scheduling etc. is match any existing systems and any changes needed to accomplish this will be the responsibility of the TCC.

PART 4 – SUBMITTALS:

4.1 The TCC shall not start the project installation until the shop drawing submittals have been reviewed by the Engineer.

4.2 Submittals shall include hardware, end devices, ancillary control components, a written operating sequence, unitary control wiring, building floor plans showing communication cabling and labels as well as logic flow diagrams. All submittals shall be provided on paper and electronically in PDF format.

4.3 Submittals shall contain one control drawing per specified system and equipment. Drawing shall include point descriptors (DI, DO, AI, AO), addressing, and point names. Each point names shall be unique (within a system and between systems). For example, the point named for the mixed air temperature for AHU #1, AHU #2, and AHU #3 shall not be MAT but should be named AHU#1MAT, AHU#2MAT, and AHU#3MAT. The point names should be logical and consistent between systems and AHU's. The abbreviation or shorthand notation (e.g., MAT) shall be clearly defined in writing by the TCC.

4.4 Control diagrams shall identify: System being controlled (attach abbreviated control logic text, all digital points, analog points, virtual points, all functions (logic, math, and control) within control loop, legend for graphical icons or symbols, definition of variables or point names and detailed electric connections to all control devices and sensors.

4.5 Points list shall include all physical input/output. Points list shall be provided in both hard copy and in electronic format and shall include Name, address, engineering units, high and low alarm values and

alarm differentials for return to normal condition, default value to be used when the normal controlling value is not reporting, message and alarm reporting as specified, identification of all adjustable points and description of all points.

4.6 Submittals shall contain floor plans depicting DDC control devices (control units, network devices, LAN interface devices, and power transformers as well as static pressure sensor in duct and temperature sensors in rooms) in relation to mechanical rooms, HVAC equipment, and building footprint.

4.7 Submittals shall contain DDC system architecture diagram indicating schematic location of all control units, workstations, LAN Interface devices, gateways, etc. Indicate address and type for each control unit, Indicate protocol, baud rate, and type of LAN per control unit.

4.8 Electrical wiring diagrams shall include motor start, control, and safety circuits and detailed digital interface panel control point termination diagrams with all wire numbers and terminal block numbers identified. Indicate all required electrical wiring. Provide panel termination drawings on separate drawings. Clearly differentiate between portions of wiring that are existing, factory-installed and portions to be field-installed.

4.9 Show all electric connections of the controls system to equipment furnished by others complete to terminal points identified with manufacturer's terminal recommendations.

4.10 TCC shall provide one complete drawing that shows the control-wiring interface with equipment provided by others.

4.11 Submittals shall include project specific graphic screens for each system including a picture of the screen with a list of the variables to be placed on the screen.

4.12 Submittals shall include TCC's hardware checkout sheets and test reports.

4.13 Submittals shall include the agenda for approval by the engineer and owner of the specified training periods. See training section for requirements.

4.14 Provide complete panel drawings that are:

- Clearly labeled and schematic or drawn to scale.
- Show the internal and external component arrangement so that the operators can identify the components by their position if the labels come off.
- Wiring access routes shall also be identified so that Class 1 wiring is separated from Class 2 and 3 and so high voltage wiring is segregated from low voltage wiring.
- Complete identification of all control devices (manufacturer's type, number, and function).
- Provide details for labeling all wiring, control devices, and controllers.
- Material and equipment descriptive material such as catalog cuts, diagrams, performance curves, and other data to demonstrate conformance with specifications shall be provided.

4.15 Include room schedule including a separate line for each terminal unit, heat pump, etc. indicating location and address.

4.16 Include control valve schedules including a separate line for each valve provided under this section and a column for each of the valve attributes: code number, configuration, fail position, pipe size, valve size, body configuration, close-off pressure, capacity, valve Cv, design pressure, and actuator type.

4.17 Include control damper schedule including a separate line for each damper provided under this section and a column for each of the damper attributes, including: code number, fail position, damper type, damper operator, duct size, damper size, mounting, and actuator type.

PART 5 – O&M MANUALS AND CLOSEOUT DOCUMENTS:

5.1 Refer to Mechanical Specification Section – REQUIRED SHOP DRAWINGS, ETC. for additional requirements.

5.2 Operating instructions, maintenance procedures, parts and repair manuals shall be supplied. Repair manuals shall include detailed instructions in the setup, calibration, repair, and maintenance of all equipment furnished. Also supplied with these manuals will be a complete parts listing of all devices supplied which is to include part numbers and model numbers of all parts and component parts along with exploded views of devices.

5.3 All as built drawings (wiring diagrams, flowcharts, floor plans, etc.) shall also be supplied to the owner electronically in PDF format.

5.4 System specific wiring, control diagrams, sequence of operation and points lists shall be as installed in each control panel. This means as-built drawings, not design (submittal) drawings.

5.5 Supply all software necessary for configuration of, modification, editing or communicating to any of the unitary devices. Software shall be capable of uploading and down-loading the entire unitary data base or any part of the automated system for backup or archiving.

5.6 Supply one copy of the software programming manual (hard copy and PDF format). The manual shall describe all furnished software. The manual shall be oriented to programmers and shall describe calling requirements, data exchange requirements, data file requirements, and other information necessary to enable proper integration, loading, testing, and program execution.

5.7 Provide a Bill of Materials with each schematic drawing. List all devices/equipment and match to schematic and actual field labeling. Provide quantity, manufacturer, actual product ordering number, description, size, accuracy, operating ranges (voltage, temperature, pressure, etc.), input/output parameters, etc.

5.8 Maintenance manual shall include copies of signed-off acceptance test forms, commissioning reports, start-up reports, etc.

5.9 The TCC shall turn over to owner two (2) sets of computerized back-ups of the complete temperature control system.

PART 6 – WARRANTY & SOFTWARE LICENSES:

6.1 Labor and materials for the control system specified shall be warranted free from defects for a period of 12 months after substantial completion and acceptance. Control system failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the Owner.

6.2 The TCC shall respond to the Owner's request for warranty service within 24 hours during normal business hours. The TCC shall respond to the Owner's request for Emergency service (defined as life-threatening or creating the potential to cause property damage) during the warranty period within 4 hours.

6.3 The TCC shall provide technical phone support to the owner during the warranty period for warranty related issues and for two years after the warranty period. If the technical support location of the TCC is outside of the toll-free calling area for the customer, the TCC shall have a toll-free number or accept collect calls for the purpose of providing technical support.

6.4 During the warranty period, standard parts for the DDC system shall arrive at the facility within 48 hours of placing an order. Non-standard parts (requiring re-manufacturing or ordering from another supplier) shall be shipped within 96 hours.

6.5 Operator workstation software, project-specific software, graphic software, database software, and firmware updates which resolve known software deficiencies as identified by the TCC shall be provided and correctly installed at no charge during the warranty period.

6.6 Provide licensed electronic copies of all software for each workstation, laptop, server. This includes but is not limited to: project graphic images (editing/modifying/creating), project database, trouble-shooting and debugging programs, project-specific programming code and all other software required to operate and modify the programming code (including software at system level, primary control units, secondary control units, and all communication software). Any hardware devices (cables, protection devices) required to operate the software/hardware shall also be provided.

6.7 All additional licensing needed for this project shall be supplied by TCC. Software license shall not expire or utilize any sort of protection hardware device for its use. In any case owner shall be free to direct the modification of any software license, regardless of supplier to allow open access to all controllers. Owner shall hold the software and firmware licensing. Software license shall not expire or utilize any sort of protection hardware device for its use.

6.8 System software shall be the latest version available with upgrades provided at the end of the warranty period and shall be fully licensed to the Owner for the entire system. Supply all software necessary for configuration of, modification, editing or communicating to any of the unitary devices. Software shall be capable of uploading and downloading the entire unitary data base or any part of the automated system for backup or archiving. Software shall be "IBM compatible".

PART 7 – TRAINING:

7.1 A formal on-site "Hands On" training session shall be conducted for the owner's maintenance personnel. This session shall be a minimum of one (1) eight (8) hour days to train the staff on setup, operation, and maintenance of all system(s) and/or devices. This will be at a time and location selected by the owner. One (1) additional eight (8) hour session shall be provided as “opposite season” training – generally 6 months into the warranty period. One (1) additional eight (8) hour session shall be provided at a later date. (This may be requested any time during the warranty period.) All training materials and books shall be provided. Both sessions shall be given by the manufacturers "factory" technical representative. (This is defined as someone other than the installing contractor’s representative.) All expenses are to be provided by the TCC. All training sessions shall be scheduled at owner’s request.

7.2 Training shall be a mix of, test exercises, and actual keyboard entry and screen viewing at the operator’s terminal. A curriculum shall be discussed and implemented based on the level of expertise of the employees. Hands-on experience and problem solving shall be emphasized.

7.3 If during any training session, the trainer/owner finds more than three (3) items that need repair, the training session will be immediately terminated. The session will be rescheduled for another date. The re-scheduled training session will be carried out at no additional cost to the Owner.

7.4 The training shall be oriented to making the owner self sufficient in the day-to-day use and operation of the DDC system.

7.5 Additionally, the training shall include:

- System start-up, shutdowns, power outage and restart routines, alarms, security levels, changing setpoints, changing schedules and other parameters, overrides, freeze protection, manual operation, return to automatic operation, and resetting equipment.

- All screens shall be discussed, allowing time for questions.
- Information specifically focused on showing the owner methods of troubleshooting the mechanical systems using the DDC.
- Use of laptop and hand-held operator interface device, if applicable.
- Creating, modifying, viewing, downloading, and reloading, trend logs.
- Remote access to the system.
- The other training sessions shall be oriented toward answering specific questions from Owner's staff.
- The trainer must be well grounded in both DDC system operation and in mechanical systems service and shall be the programmer.

7.6 This documentation and process shall be complete, approved and accepted by Engineer and Owner prior to acceptance. This information shall be documented as completed. A copy shall be delivered to the Engineer and Owner and included in the O&M manuals.

PART 8 – COMMISSIONING & VERIFICATION, FUNCTIONAL PERFORMANCE TESTING & CHECKLISTS:

8.1 100% compliance with the requirements of this section is a condition of the Owner's acceptance and start of the warranty period.

8.2 The TCC shall be responsible for completion of (1) their hardware checkout sheets and test reports, (2) Point-by-point confirmations of ALL points – this includes visual inspection of installed components, and (3) sequence of operation confirmation.

8.3 This documentation and process shall be complete, approved and accepted by Engineer and Owner prior to acceptance. This information shall be documented as completed. A copy shall be delivered to the Engineer and Owner and included in the O&M manuals.

8.4 Air and water balancing shall be completed (and discrepancies resolved) before the TCC's final system check and before the acceptance test to be conducted in the presence of the Engineer.

8.5 Refer to Mechanical Specification Section – GENERAL PROVISIONS for additional information and requirements.

PART 9 – WIRE MANAGEMENT, ELECTRICAL POWER, ETC:

9.1 Refer to CABLING section of this specification for additional requirements.

9.2 Electrical work required for system interlock and installation of the temperature control system shall be included in the bid and installed per all applicable codes. Coordinate with other trades as required for installation of a complete system.

9.3 All wiring and cabling in mechanical and electrical rooms shall be in conduit. No wiring or conduit can be exposed to view in any other area. Conceal all wiring and cabling in conduit in wall from thermostats or other controls devices to above ceiling. Install conduit in wall from wall thermostats to above ceiling for cabling. Route wiring directly to cable tray from control points above the ceiling. Rough-in for control devices shall be in compliance with the requirements of the ELECTRICAL SPECIFICATIONS.

9.4 Any power for controls shall be fed from dedicated circuits in emergency electrical panels, when provided for a project, and shall not be obtained from receptacles, lighting, or equipment circuits. Unitary control power may be obtained from the equipment served. If power is obtained from the equipment served, the power may not be interrupted to the electronics if the equipment is off for any reason.

9.5 The TCC shall be responsible for the power source to any control panels, unitary controllers, etc. on any controlled equipment and all other control power requirements. This includes circuit breakers, wiring, conduit, etc. installed in strict accordance with NEC. The TCC may contract with the electrical contractor for the power wiring installation.

9.6 Prior to installation, through coordination with all trades, that appropriate clearances (36" minimum) as required by the N.E.C. are maintained at all control panels, including unitary controllers for heat pumps, etc.

9.7 The TCC shall provide all CAT5 or CAT6 cabling network cabling for a complete system. This shall include cabling to the Owner's data drop. The main system data drop will be provided by others.

9.8 All control circuits within the electrical panels shall be marked to indicate equipment served.

9.9 The TCC shall perform all temperature control interlock wiring. This shall include control valves, dampers, thermostats, indoor/outdoor HVAC systems, etc. Electrical work required for system interlock and installation of the temperature control system shall be included in the bid and installed per all applicable codes. Coordinate with other trades as required for installation of a complete system.

9.10 The TCC shall be responsible for any power required for the unitary controls or control panels. This includes low voltage and 120 volt circuit breakers, wiring, conduit, etc. installed in strict accordance with NEC. The TCC may contract with the electrical contractor for the power wiring installation.

9.11 Provide one duplex outlet mounted inside the control panel and separately fused with a non-time delay fuse at 15 A at any panel location containing electronic control components. This receptacle may be served from the control panel 120 VAC power source.

9.12 All wiring shall be continuous runs. Any junctions must be made in metal enclosure.

9.13 Grounding terminals shall be color coded green and yellow and shall be compatible with the other specialty terminals specified above and shall mount on the same DIN rail system. Units shall be arranged so that the wiring connected to them is grounded to the enclosure via the mounting rail. These terminals shall be provided for grounding cable shields at the points where the cables enter a control panel and terminate on the control panel terminal strip. Terminals shall be Entrelec M 4/5.3A.PI or equivalent by Weidmuller, Phoenix, or Allen Bradley.

9.14 The Department of Housing, Building and Construction's Electrical Division requires that all new lighting control panels, new Building Automation Systems control panels, and new conventional HVAC control panels be certified as being constructed and wired in accordance with NFPA 70 110.3 (a) (1) and article 409.

9.15 Contractor shall control panels have an identification label stating the "Certification Agency" such as UL, CSA, CE, etc. or a label of certification for each control panel by a Professional Engineer (P.E.) registered in the State of Kentucky, stating that the design of the control panel was under their direct supervisory control. Include with shop drawings.

9.16 The Electrical Advisory Council for the State of Kentucky requires that only an electrical contractor licensed by the State of Kentucky with a licensed Master Electrician and a licensed on-site electrician can install the electrical wiring for lighting controls systems or Building Automation Systems (BAS).

PART 10 – CABLING:

10.1 Refer to WIRE MANAGEMENT section of this specification for additional requirements.

10.2 ALL CONTROL WIRING SHALL BE INSTALLED IN A WIRE MANAGEMENT SYSTEM TO INCLUDE CABLE TRAYS, BRIDLE RINGS, & CONDUITS. NO EXCEPTIONS! COORDINATE WITH ELECTRICAL CONTRACTOR TO A COMPLETE WIRE MANGEMENT SYSTEM.

10.3 Acceptable cable manufacturers are Belden, West Penn, or Alpha.

10.4 A complete cabling system shall be furnished and installed, which shall adhere to the highest workmanlike standard of quality and appearance. Cabling shall be installed square with building lines and contained within a wire management system.

10.5 All sizing of cabling shall be according to manufacturer's recommendations but shall be a minimum of 18 AWG.

10.6 Furnish a floor plan of the building indicating communication cable labeling and routing as well as addresses and branch wiring from the unitary devices. All cabling shall be labeled on both ends. The type, size and label of all cabling shall be indicated on submittal floor plan drawings.

10.7 Wall space temperature sensor cabling (from the sensor to the unitary controller) shall have a minimum of four (4) conductors.

10.8 All cabling shall be stranded. "NO" solid conductors will be accepted. All cabling shall be 100% shielded with appropriate drain wire and insulation.

10.9 All cable connections shall be continuous run (including shield). Any junctions must be made in a metal enclosure, connections must be soldered, taped and the metal enclosure must be mechanically attached to the nearest ground. No wire nuts or crimped connections will be accepted. Note location of junction boxes on the as built floor plans. All cabling networking unitary controllers, and other networked equipment, shall be in soldered.

10.10 All shields must be terminated as per manufacturer's recommendation. Shield termination requirements by the manufacturer must be provided with submittals.

PART 11 – SYSTEM SOFTWARE:

11.1 System software will be the latest version available with upgrades provided for full warranty period and shall be fully licensed to the owner for all network controllers and servers. Refer to WARRANTY section of this specification for additional requirements.

11.2 The BAS shall include trend logging screens accessible from tabs on the home page for building utilities usage.

11.3 System software shall, at a minimum, provide:

- Monitor and supervise all control points.
- Add new points and edit system database.
- Change control setpoints, timing parameters and loop tuning of PID coefficients in all control loops in all control units.
- Enter programmed start/stop schedules.
- View alarm and messages.
- Modify existing control logic (or sequence of operation) in all control units.
- Upload/Download programs, databases, control parameters, etc.
- Modify graphic screens.

11.4 Sequence of operation programming methodology - The application software shall be user programmable. Application programming shall be (1) Line type programming that uses text programming in a language similar to BASIC or FORTRAN, or (2) graphical block programming - The

method of programming shall be by manipulation of graphic icon "blocks." Each block represents a subroutine containing the programming necessary to execute the function of the device that the block represents.

11.5 Unitary Control Unit Database Archiving - The host software shall provide capability to upload sequence of operation, database, and other control parameters from each controller. Uploaded programs shall be retained on hard disk for system backup. Programs may be modified using Editor functions and downloaded to individual controllers as desired. Downloading of databases shall not interrupt other multi-tasked functions that are ongoing.

11.6 THIRD PARTY SOFTWARE PACKAGES: The host software shall provide the capacity to run third party software packages for word processing, spreadsheets, or database management programs. Use of third party software shall not suspend operation of background tasks of multi-tasking operating system, such as alarm logging, and report generation.

PART 12 – NETWORK CONTROLLER

12.1 Install the Network Controller in a surface mounted panel, NEMA type 1 enclosures, with a removable hinged door. Provide a flush mounted key lock. All control panels must be painted the same color and identified. The boxes are to be made from 16 gauge material. Panels should not be provided with knockouts.

12.2 Control panels shall be constructed by a UL approved panel manufacturer. The standard used shall be UL508A. All proper labels are to be attached. Panel shall meet arc flash requirements.

12.3 The Network Controller shall be web-based and communicate BACnet IP. It shall issue all time schedules, summer/winter commands, customized trending, holiday scheduling, alarm handling, clock, or other shared commands to all unitary controllers within the building network. If for any reason communications between the unitary(s) and the Network Controller is lost, the unitary(s) shall operate in a stand-alone manner (in day operation) until communications is restored. It shall also operate in the “summer” or “winter” mode as last commanded.

12.4 The Network Controller shall be integrated and interoperable with the facility infrastructure and include user access to all system data locally over the Local Area Network (LAN) / Wide Area Network (WAN) within the building and remotely by a standard Web Browser over the Internet. Any computer connected to the network, utilizing a web browser, and having the proper password.

12.5 The Network Controller shall be a fully user-programmable, supervisory controller. It shall monitor the network of distributed unitary controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Controllers.

12.6 The Network Controller shall have battery back-up to allow a minimum of seven days of operation. The Network Controller shall be composed of one or more independent, stand-alone, microprocessor to manage the network strategies described in Application software section. The network controller shall have ample memory to support its operating system, database, and programming requirements. The operating system of the Network Controller shall manage the input and output communications signals to allow distributed unitary controllers to share real and virtual point information and allow central monitoring and alarms. The database and custom programming routines of the Network Controller shall be editable from a single operator station.

12.7 The Network Controller shall be remotely monitored via the internet. Additionally, it shall include automatic emailing and texting out alarms, gathering alarms, reports and logs, programming and downloading database.

12.8 The Network Controller shall continually check the status of all processor and memory circuits. If a failure is detected, the controller shall:

- Assume a predetermined failure mode.
- Emit an alarm.
- Display card failure identification.

12.9 Under no circumstance shall more than 75% of the total number of sensor and control points be connected through a single Network Controller. Each DDC system component shall provide for the future addition of at least 20% of each type of the number of sensor and control points connected to that component including a minimum of one universal input and one universal output.

PART 13 – UNITARY CONTROLLER

13.1 Unless otherwise specified, each piece of equipment shall have its own Unitary Controller (i.e., heat pump, AHU, terminal unit, etc.). The Unitary Controller for each piece of equipment shall be mounted on the side of the unit. The Unitary Controller for all other equipment shall be mounted in a panel and properly labeled.

13.2 Each Central Station Air Handler and/or Outside Air Unit shall have its own Unitary Controller mounted where shown on the drawings. If an installation location is not clear, the Contractor shall notify the Engineer for clarification prior to installation.

13.3 Unitary Controllers used in conditioned ambient shall be mounted in dust-proof enclosures, and shall be rated for operation at 32 degrees F to 120 degrees F. All Unitary Controllers shall have an RJ-11 or similar type connection for monitoring or programming access by room or local equipment level with access to any unitary within the network without modification.

13.4 Control panels shall be constructed by a UL approved panel manufacturer. The standard used shall be UL508A. All proper labels are to be attached. Panel shall meet arc flash requirements.

13.5 Unitary Controllers utilized in the network shall have full stand alone capability including time of day and holiday scheduling as well as all energy management functions such as optimal start/stop, duty cycling, etc. The terminal unit Unitary Controllers may be pre-programmed with the project specific sequence of operation as specified for the application. Any re-programming of the electronics shall be performed on location using a portable personal computer with appropriate software or through the Network Controller. The entire unitary data base shall have the capability of being backed up and or downloaded locally.

13.6 All points to have a unique digital input to the BAS system. The use of digital point count expanders is not an acceptable replacement to digital inputs to the unitary controller. The conversion of a single universal input channel to accept up to multiple voltage free contacts such as relay contacts, auxiliary starter contacts, differential pressure switches, etc. IS NOT ACCEPTABLE.

13.7 Unitary Controllers shall communicate via BACnet MSTP or LonMark/LonTalk communication protocol. A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided for each Unitary Controller that will communicate on the BACnet MS/TP Bus.

13.8 All Unitary Controllers shall be fully application programmable. All control sequences within or programmed into the unitary controller shall be stored in non-volatile memory, which is not dependent upon the presence of a battery shall be retained.

13.9 Unitary Controllers shall have a 10% spare point capacity to be provided for all applications.

13.10 The Unitary Controller for each piece of equipment shall be mounted on the side of the unit. The unitary controller for all other equipment shall be mounted in a panel and properly labeled. Prior to installation, through coordination with all trades, that appropriate clearances (36” minimum) as

required by the N.E.C. are maintained at all control panels, including unitary controllers for heat pumps, etc.

13.11 After a power failure, the Unitary Controller shall operate the control application using the current setpoints and configuration. Reverting to default or factory setpoints are not acceptable.

PART 14 – SENSORS AND MISCELLANEOUS DEVICES:

14.1 WEATHER STATION HOUSING: Provide Kele Model A21 Outdoor Aspirated Humidity/Temperature housing. NEMA 3R enclosure is painted white to reduce the effect of radiation, and the enclosure has a lockable latch for security. The outdoor air sensor will be installed on the north wall in the shade as not to be affected by sunlight, building ventilation or weather. This location shall be indicated on the control drawings. Installation in outside air ductwork or louvers is not acceptable. If not installed to provide "accurate" temperature readings, it shall be relocated (at the TCC's expense) until a suitable location is found.

14.2 SENSOR RESOLUTION: All temperature sensors shall have a minimum resolution of 1/10th of 1 degree F. (0.1 degree F.) Sensor stability shall be 0.24 degrees over a year period. Space sensors shall be tested and accurate to within 0.75 degrees F. Outside air, water and duct sensors shall be tested and accurate to within 2.0 degrees F.

14.3 SPACE SENSORS AND THERMOSTATS:

- Refer to the drawings for proper type and location.
- All thermostat and sensors shall be provided with temperature indication, unless otherwise noted.
- Programmed set-point shall be locally adjustable limited to 2 degrees above set-point and 2 degrees below set-point for supervised areas.
- Unsupervised areas shall have non-adjustable set-point.
- Generally, thermostats/sensors shall be installed 5'-0" above the finished floor.
- Where thermostats/sensors are to be mounted next to a light switch, install at the same height as the light switch.
- Sensors in hallways, vestibules, stairways, restrooms and locker rooms shall utilize a stainless steel surface mount temperature sensor installed on an interior wall or partition (2"x4" blank plate). Care must be taken in the installation of these sensors to ensure proper insulation from the wall temperatures in order to properly sense space temperature.
- If there is a question consult engineer prior to rough-in.

14.4 WATER SENSORS: Temperature sensors for water lines are to be the well type. Wells are to be threaded brass (same manufacturer as the temperature sensor) with the sensor coated with a heat transfer compound. Strap on sensors will not be acceptable.

14.5 MIXED AIR SENSORS: These sensors shall be bendable averaging, type made of copper or aluminum elements. In unit ventilators, these sensors shall be at least five (5) feet in length and installed in the discharge air of the unit. For Air Handling Units, Outside Air Units, etc. the sensors shall be at least 20 feet in length.

14.6 DISCHARGE AIR AND DUCT ROOM RETURN AIR SENSORS: Shall be rigid insertion type. In all applications, care shall be taken to that the sensors are securely mounted as not to allow any vibration and installed in such a manner as to indicate the truest possible temperature.

14.7 FREEZE/LOW-LIMIT THERMOSTAT: Provide a freeze/low-limit thermostat in each Air Handling Unit, Outside Air Unit, etc. with a water coil for freeze protection. These devices shall be the manual reset type. This device shall be wired by using a normally closed contact in series with the motor starting circuit and a normally open set of contacts as an input to the unitary controller. The element shall be constructed of copper and be at least 20 feet in length. It shall be installed serpentine across the air entering the coil. In some cases, it may require being installed after the coil. Each application

should be closely evaluated before installation. The device shall sense the lowest temperature by any one foot section of its element.

14.8 HUMIDITY SENSORS: These devices shall be 100% solid state, linear and temperature compensated with scaling 0-100% RH range with LED or LCD Display. Accuracy at 25°C from 10-80% RH* ±2%, operating Humidity Range 0 to 100% RH (non-condensing), Stability ±1% @ 20°C (68°F) annually, for two years, Hysteresis 1.5% typical, Temperature Effect ±0.1% RH/°C above or below 25°C (typical), 1% accuracy between 0% - 90% RH, Operating Temperature Range -40° to 50°C (-40° to 122°F) +/- 1%.-Do not submit products that do not meet this range. The output of the device shall utilize an analog output 4-20 mA, 2-wire, polarity insensitive, (clipped and capped). The device shall use a power supply of 24 VAC or VDC. Duct mounted sensors shall have at least 4" insertion probe with a 16 gauge steel enclosure. NIST traceable certification shall be provided to the Engineer as part of the shop drawings. For wall mounted sensors the enclosure shall be polystyrene plastic mounted next to and at the same height as the temperature sensor in that area. Both shall have the same appearance. Provide protective cages in fitness and common areas.

14.9 COMBINATION TEMPERATURE/HUMIDITY SENSORS: All temperature sensors shall have a minimum resolution of 1/10th of 1 degree F. (0.1 degree F.) Sensor stability shall be 0.24 degrees over a year period. Space sensors shall be tested and accurate to within 0.75 degrees F. The humidity sensing device shall be 100% solid state, linear and temperature compensated with a 0-100% RH range. The response time shall be a minimum of 30 seconds for a 60% change. They shall have a minimum of 2% accuracy minimum accuracy of +/-2% RH minimum rangeability 5 to95% RH non-condensing and maximum hysteresis +/_1.5% RH. – Do not submit products that do not meet this range. The output of the device must utilize a 0-10 VDC or 4-20mA signal as required. The device must use a power supply of 24 VAC or VDC. Duct mounted sensors shall have at least 4" insertion probe with a 16 gauge steel enclosure. NIST traceable certification shall be provided to the Engineer as part of the shop drawings. For wall mounted sensors the enclosure shall be polystyrene plastic mounted next to and at the same height as the temperature sensor in that area. Both shall have the same appearance. Provide protective cages in fitness and common areas.

14.10 LOW PRESSURE TRANSDUCERS: These devises shall be 100% solid state, linear and temperature compensated. Accuracy shall be no less than plus or minus 1% of its full range. Linearity, repeatability, and hysteresis shall be no less that plus or minus 0.1%. All pressure sensors shall utilize output averaging/output clipping to adjust and stabilize any fluctuations in the output. The output of the device shall utilize a 0 - 10 VDC signal. The device shall use a power supply of 24 VAC or VDC. The enclosure 16 gauge steel. For sensing internal static pressure of air handling ducts utilize sensors with a rage of 0 to 5 inches water column. For sensing building static pressures (building compared to atmospheric) utilize a sensor with a range of -0.25 to +0.25 inches water column.

14.11 RELAYS: Relays for starting and stopping fractional horsepower motors shall be rated as follows:

- 1/4 horsepower motors or less use 15 ampere rated relays,
- 1/3 horsepower motors use 20 ampere rated relays,
- 1/2 horsepower motors use 30 ampere rated relays,
- Relays used for pilot duty service shall be rated at a minimum of 10 amperes.
- Provide auxiliary pilot duty relays on motor starters as required for control function.
- Do not install control and status relays in packaged equipment control panel enclosures containing Class 1 starters.

14.12 CENTRAL STATION AIR HANDLERS: All Central Station Outside Air and Rooftop Air Handling Units, etc. shall be provided with a D.A.P. (differential air pressure) switch across each the supply fan to provide fan status for each air handler.

14.13 SMOKE SHUTDOWN: All AHUs, OA units, Heat Pump Units, etc. with fans of greater than 2,000 CFM are required to have smoke shutdown safeties as required by the Building Code. These smoke detectors shall have a set of auxiliary contracts wired to a dedicated input of the Unitary to provide

status of the smoke detector. All units must be provided with a current sensor to provide fan status for each air handler. For projects with Outside Air (OA) units, any system fire alarm activation shall shutdown all OA units. Coordinate with the Fire Alarm Contractor to a complete, code compliant installation.

14.14 CURRENT SENSING DEVICES: Veris Industries model Hx08 Series and H701 or equal. All current sensors shall be capable of alarming to the BAS for belt losses, pump coupling shear or other mechanical failure on loads.

14.15 SINGLE DIRECTION WATER FLOW METER: Onicon Model F-1200 series dual turbine insertion flow meter. 50:1 turn down with 2% accuracy with 0.4 to 20 fps range. Install flow meter with sufficient pipe diameters as recommended by manufacturer. Provide factory authorized start-up verification of operation and calibration. Provide with remote display where indicated.

14.16 BTU METER: Provide and install ONICON System -10 MTU Meter system, including F-1200 dual turbine insertion flow meter, supply and return temperature sensors and wells and control panel. The entire system shall be factory calibrated and programmed for particular system where installed (heat pump system and 2-pipe system) and shall be re-programmable at the control panel keypad. Furnish a certificate of calibration for each BTU meter. Interface the control panel into the DDC controls system to obtain energy totals, flow rates, temperatures (supply and return) for trending. Install flow meter with sufficient pipe diameters as recommended by manufacturer. Provide factory authorized start-up verification of operation and calibration. Provide with remote display where indicated.

14.17 DIFFERENTIAL PRESSURE TRANSMITTERS: Provide Rosemount (ITT Bell & Gossett ST-102R) or Johnson Controls Setra DPT 2302-050-V field mounted differential pressure sensor transmitters as indicated on the plans. Range shall be 0-25 psig. Accuracy shall be .025% full span.

14.18 CARBON DIOXIDE SENSORS: This sensor shall have a range of 0-2000 ppm +/-5% and +/- 50 ppm. Analog output of 0-10 or 2-10 VDC. Power shall be 24VAC. Calibration interval rated for 5 years. Sensor shall not be provided with a digital display. Honeywell Model C7232 or equal. A replacement CO2 sensor shall be installed annually for 5 years after substantial completion by the Controls Contractor. Provide with LED display.

PART 15 - VALVES, DAMPERS AND ACTUATORS:

15.1 Unless otherwise specified, valves shall be furnished and sized by the TCC. The valves are to provide the required capacity and the close off rating shall be in excess of the system pressures encountered (minimum 40 psi differential). Proportioning-type valve bodies shall be packed type with throttling type inner valve (quick close plug shall not be acceptable). Proportional type valves to be rated at 125 psi static pressure. Modulating control valves shall be selected within a 3-5 psig pressure drop range. Two position control valves (open/close) shall be line size.

15.2 Dampers for various units requiring field mounting shall be tight closing, "ultra low leakage", opposed blade with side and edge seals. They shall be sized and furnished under this section. Installation of dampers shall be by the sheet metal contractor, coordinated by the TCC. Frames shall be no less than 16 gauge galvanized steel and furnished with mounting holes for duct mounting. Damper blades shall be no less than 14 gauge galvanized steel with maximum blade width of 8 inches. Blades shall be secured to 1/2 inch zinc plated axles and hardware with nylon bearings. Provide thrust bearings at the end of each blade. **All dampers shall have end switches to positively prove damper position. No Exceptions!**

15.3 All damper and valve actuators shall be fail safe spring return type with sufficient force to operate the dampers or valves under all normal operating conditions. They shall return to the normally open position upon a loss of power. Exceptions to the spring return applications are (1) face and bypass actuators, (2) boiler 3-way loop mixing valves, (2) boiler room seasonal changeover valves. Actuators for fan coil units, terminal units, etc. shall fail in the last position.

15.4 "ALL" Actuators shall be of the same manufacturer and have internal feedback circuitry to provide a positive action to proper positioning of the damper or valve through the entire sequence. Actuators shall have an adjustable starting point to accurately set the range of travel to the output of the controller. All actuators shall also utilize the same input signal (6-9 VDC, 0-010V, 2-10 VDC, 4-20 MA) in order to maintain some consistency in the control application. Analog actuation is 6-9 VDC, 0-010V, 2-10 VDC or 4-20 MA, floating point control with 2 digital outputs is NOT approved as analog actuation.

15.5 Actuators may be factory installed. If not, factory installed, they shall be installed as per instructions by the terminal equipment manufacturer.

15.6 Locations mounted above ceiling shall be marked on ceiling grid.

15.7 Install damper motors on the outside of the duct in warm areas where possible, not in air stream or locations exposed to outdoor conditions.

PART 16 – OPERATOR INTERFACE AND SERVER:

16.1 Include TWO laptop operator interfaces in the bid as follows:
- Processor: 2.7 GHz or higher.
- Operating System: Microsoft latest operating system
- Memory: 6GB
- Hard Drive: 500 GB minimum
- Monitor: 16" HD LED widescreen, VGA/DVI
- Video Card: HD Graphics VGA, HDMI
- Optical Drive: 16X DVD+/-RW with double-layer DVD+/-R write
- Network Support: Ethernet adapter (10/100 Mb with RJ-45 connector)
- Wireless Network Support: wireless 802.11b and 802.11g protocols must be supported

16.2 Provide uninterruptible power supply (UPS) for all major components. This includes all front ends, routers, servers, and control workstations on site.

PART 17 – REFRIGERANT MONITORING SYSTEM:

17.1 Not required.

PART 18 – ISOLATION ROOM CONTROL SYSTEM:

18.1 Not required.

PART 19 - VARIABLE FREQUENCY DRIVES (VFDs):

19.1 The work includes all labor, materials, and related items to completely furnish and install, start up and test, and place into service the Variable Frequency Drives (VFDs) indicated and scheduled on the Drawings and described in the Specifications.

19.2 VFDs shall be as manufactured by ABB, Graham/Danfoss, or Square D. These are the only acceptable manufacturers. All VFDs for the project shall be by the same manufacturer (no exceptions).

19.3 VFDs shall be consist of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor.

19.4 The VFD shall be capable of operation form AC voltage in two rages 208–240 VAC ± 10%, or 380–

480 VAC ± 10%. 50/60 HZ operation, ± 2 hertz.

19.5 The VFD enclosure shall be rated UL type 1 and shall be UL listed as a plenum rated, suitable operating conditions: $0 – 40^0$ C continuous. Drives that have thermal cut out circuits, or that cannot operate continuously at 40^0 C shall not be acceptable. Altitude 0 to 3300 feet above sea level, up to 95% humidity, non-condensing.

19.6 The VFD shall produce an adjustable AC voltage/frequency output for step less motor speed control utilizing sine wave coded Pulse Width Modulation (PWM) The Drive shall provide automatic power factor correction and a .98 displacement power factor by incorporating a full wave diode bridge rectifier. The VFD shall have an overload rating of 110% of nominal rated current for 1 minute out of every 10 minutes of operation, which is an acceptable overload for centrifugal loads.

19.7 The VFD shall include a built-in first environment RFI/EMI filter and be CE and UL labeled. It shall also meet the CE requirement of EN61800-3 which provides an actual test procedure that shows that the VFD is immune from RFI/EMI interference and at the same time does not emit RFI/EMI noise that would interfere with other sensitive equipment near the VFD.

19.8 The VFD shall include as a minimum a 5% dual DC link or AC line reactor for a clean harmonic signature, which aides in complying with IEEE-519-1992 recommended levels. The VFD manufacturer and representative shall assist in ensuring that the VFD's applied meet IEEE-519-1992 by completing a computer aided Harmonic Analysis of the complete system.

19.9 The VFD shall include as a standard a built-in digital keypad/display panel. This panel shall provide "Hand" off "Auto" selection, and a manual speed adjustment via up and down arrows. All faults and warnings shall be provided in "Plain English" for operation without a manual. The drive shall have a complete manual stored in memory that can be accessed with a single keystroke. This display shall be password protected and allow all setup parameters to be adjusted only by authorized personnel.

19.10 The VFD shall include built in Startup, Diagnostic, and Maintenance assistants, which allow for step-by-step startup procedures, troubleshooting, and the ability to indicate when the VFD and the system it is applied to needs preventive maintenance performed.

19.11 The VFD shall include a real time clock with a day/date stamp for troubleshooting purposes. In addition, with the use of this clock the drive shall be capable of stand-alone operation and act as a unitary controller.

19.12 The VFD shall include (2) Analog inputs either 4–20 madc or 0-10 vdc, (6) programmable Digital Inputs, (2) Programmable analog Outputs, (3) Form C Relay output rated 2 amps continuous minimum, and (2) PID Process controllers.

19.13 The VFD keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (LED and alpha-numeric codes are not acceptable). All VFD faults shall be displayed in English words.

19.14 BYPASS: As scheduled on the drawings, the drive shall be provided with an integral Bypass circuit which includes a pair of 115V electrically interlocked contactors for drive and bypass operation. The drive shall include a main input circuit breaker, drive input service/isolation switch, and motor overload protection adjustable for either Class 10, 20 or 30 operations. The bypass shall include a built-in status display which shows via colored LED's the system operational status including safeties and run permissive for ease of operation. The Bypass shall have its own interactive, programmable keypad. The Bypass shall provide single-phase protection for the motor while operating in bypass. Bypass that does not protect the motor from single-phase operation shall not be acceptable.

19.15 The drive and bypass system shall have embedded serial communication capabilities that allow direct connection to Modbus, Johnson Controls, Siemens and BACnet automation systems as part of

the drives software suite without the need for extra hardware cards or gateways. The connection shall be tested by the BACnet Testing Labs (BTL) and be BTL Listed. The BACnet interface shall conform to the BACnet standard device type of an Applications Specific Controller (B-ASC). In addition, the drive shall be capable of interfacing with Lonworks with the addition of a communication module.

19.16 All VFDs shall be provided and installed in strict accordance with the manufacturer's recommendations.

19.17 Factory-authorized startup for each drive is mandatory. Provide a written record of the startup of each unit. Start up and programming by a factory-authorized technician. At startup, lockout any speed with the VFD that does not meet the vibration allowanced of the equipment manufacturers.

19.18 A parts and labor warranty of **3 years from startup and 2 years from the date of substantial completion** shall be included. Warranty shall include travel time and expenses.

PART 20 – GRAPHICS SCREENS AND TRENDS:

20.1 All graphics screens shall be submitted for review by Engineer. Provide the following animated, color graphics screens minimally:

20.2 Entire floor plan home screen with OAT, Time, and Date displays.

- Floor plan showing major zones,
- Click major zone displays enlarged floor plan of the zone showing individual heat pump zones & numbers. Include link to respective mechanical room.
- Click individual zone shows heat pump graphic. Display all data points from points list, occ/unocc schedule and setpoints, cfm and setpoint, OAT, Time and Date.

20.3 Color Graphic Screens shall be designed for all mechanical systems and shall include the following:

- A graphic shall be the starting page with the building graphically indicated. Break up the floor plan into zones to match Contract Documents. The building shall be the point of reference to enter into the respective building control system.
- All heat pump units including pumps, filters, humidifiers, etc.
- All OA units.
- Domestic hot water heaters and pumps.
- The summation of all supply OA for each unit shall be displayed on the AHU graphic pages.
- All floor plans indicating all actual room numbers, thermostats, and mechanical equipment. Operator shall be capable of clicking on any equipment and pull up the respective graphic screen.

20.4 Graphics to include floor plans with room numbers (as-built room numbers) and thermostat locations, links to flow diagrams for heat pumps, zone dampers, hydronic loop systems, outside air systems, domestic hot water, and lighting controls.

20.5 All new graphics shall match the existing system graphics, unless noted otherwise.

20.6 The graphical programming software shall allow for interactive mouse-driven placement of block icons on the graphic screen and connection of block inputs to block outputs by means of drawing lines to form a graphic logic diagram. The user shall not have to manually input text to assign block input/output interconnections. Blocks shall allow entry of adjustable settings and parameters via pop-up windows.

20.7 The clarity of sequence shall be such that the user has the ability to verify that the system programming meets the specs without having to learn or interpret a manufacturer's unique programming language. Provide a means for testing and/or debugging the control programs off-line

(not communicating with control units) using operator entered values for physical inputs and time. Provide a means for testing and/or debugging the control programs on-line (communicating with control units), showing actual physical inputs land all block outputs in real time.

20.8 Provide a utility that shall allow the graphic logic diagrams to be directly compiled into application programs. Logic diagrams shall be viewable either off-line, or on-line with real-time output values.

20.9 All graphic software shall be in the html web browser format and support multiple simultaneous screens to be opened and resizable in a "Windows" type environment. All functions, except text entry, shall be executable with a mouse. Graphic software shall provide for multitasking such that third party programs can be used while the Operator Workstation Software is on-line. Provide the ability to alarm graphically even when operator is in another software package. The software shall allow for Owner to create user defined, color graphic displays of geographic maps, building plans, floor plans, and mechanical and electrical system schematics.

20.10 The contractor shall provide libraries of pre-engineered screens and symbols depicting standard air handling unit components (e.g. fans, coils, filters, dampers, etc.), mechanical system components (e.g., pumps, heat pumps, etc.), complete mechanical systems and electrical symbols.

20.11 The graphic development package shall use a mouse or similar pointing device to allow the user to perform the following:

- Define symbols
- Position items on graphic screens
- Attach physical or virtual points to a graphic
- Define background screens
- Define connecting lines and curves
- Locate, orient and size descriptive text
- Define and display colors for all elements
- Establish correlation between symbols or text and associated system points or other displays.
- Create hot spots or link triggers to other graphic displays or other functions in the software

20.12 The TCC shall including programming of 25 point trends as directed by the Engineer. These can be requested at any time during the project including the warranty period. Trend “change of state” for digital inputs. Trend analog points in 30 minute increments. Maintain trend history for 30 days. Include the following:

- Outside air temperature
- OA unit leaving air temperatures for each unit
- VFD speeds (OA & EA)
- Heat pump main supply and return temperatures
- Heat pump main flow rate
- Water to water unit main supply and return temperatures (load side)
- Critical room space temperatures
- Domestic hot water supply temperatures
- Freezer/Cooler temperatures
- Makeup water flow rate
- Electrical power kW and kWh
- Others as directed in the field

PART 21 - TIME SCHEDULES (ALL TIMES SHALL BE USER ADJUSTABLE):

21.1 During construction, the time schedule (for all equipment except OA unit) will be Occupied at 5:00 AM, Unoccupied at 10:30 PM. seven (7) days a week.

21.2 When the system is fully tested and operational and after the Owner’s staff have been fully instructed as to the operation of the system the schedule shall be as follows unless otherwise instructed:

21.3 CLASSROOM AREAS: Monday through Friday Occupied mode at 7:15 AM, Unoccupied mode at 3:30 PM. Unoccupied for Saturday and Sunday. Stage Classrooms in Area B on first, Area C on 15 minutes later and all other spaces 15 minutes after Area C.

21.4 KITCHEN AREA: Monday through Friday Occupied mode at 6:00 AM, Unoccupied mode at 2:00 PM. Unoccupied for Saturday and Sunday.

21.5 GYMNASIUM: Monday through Friday Occupied mode at 7:15 AM, Unoccupied mode at 3:30 PM. Unoccupied for Saturday and Sunday.

21.6 Administration areas: Monday through Friday Occupied mode at 7:00 AM, Unoccupied mode at 4:00 PM. Unoccupied for Saturday and Sunday.

21.7 Cafeteria: Monday through Friday: Occupied mode at 7:15 AM, Unoccupied at 12:30 PM. Unoccupied for Saturday and Sunday.

21.8 Building outside air handling unit shall operate Monday thru Friday, 7:50 AM to 2:40 PM.

21.9 Each piece of equipment shall have its own adjustable time schedule.

21.10 All schedules shall be coordinated and confirmed with the Owner prior to final implementation.

PART 22 - LIGHTING CONTROL SYSTEM:

22.1 None required.

PART 23 – ROOFTOP UNITS (RTU-X)

23.1 Each rooftop unit consists of a supply fan, exhaust fan, DX refrigerant cooling system, gas heat. RTU-1 and RTU-2 shall have a hot-gas reheat coil.

23.1.1 Occupied setpoints: Cooling = 74°F | Heating = 68°F
23.1.2 Unoccupied setpoints: Cooling = 85°F | Heating = 60°F

23.2 When all RTU's are unoccupied, and the space temperature is below the unoccupied heating setpoint the supply fan and units heating and cooling capacity shall cycle to maintain unoccupied setpoint. The outside air damper shall remain closed.

23.3 RTU-1 and RTU-2: During occupied periods, the supply fan shall run continuously and vary fan speed to maintain space temperature setpoint for VAV-single zone operation (in cooling mode the compressor and fan speed shall match to maintain 55°F discharge air temperature). The outside air damper shall open to minimum 5% position. The RTU compressors, gas heat and unit dampers shall cycle/modulate to maintain space temperature and CO2 setpoint. If space humidity rises above 60% RH, the unit shall be placed in dehumidification mode.

23.3.1 CO2 Control: When the space CO2 differential is 700 PPM between the indoors and outdoors the outside air damper shall modulate from min position to maintain 600 PPM differential.

23.3.2 Dehumidification Mode: VAV-single zone unit shall be placed in full cooling mode with associated supply fan airflow. The hot gas reheat coil shall vary capacity to maintain space temperature setpoint. Once space humidity falls below 55% HR, dehumidification mode shall be disabled, and cooling mode enabled.

23.4 Economizer: When unit is in cooling mode and the outside air temperature is below 57°F economizing shall be enabled. The outside air damper shall modulate between its minimum position

and 100% open position to maintain space temperature setpoint. Compressors shall be disabled during economizer operation.

23.4.1 Comparative Enthalpy: Outside air (OA) enthalpy shall be compared with Return air (RA) enthalpy. The economizer shall be enable when OA enthalpy is less than RA enthalpy - 3.0 BTU/LB. The economizer shall disable when OA enthalpy is greater than RA enthalpy and cooling mode shall be enabled.

23.5 The unit shall be provided with a condensate overflow switch. If condensate overflow is detected, the unit shall be shut-down.

23.6 A smoke detector shall be located in return air stream of units greater than 2,000 CFM. If smoke is detected, then the system shall shutoff and an audio/visual alarm shall activate. Upon correction of the problem, the system shall be reset and shall return to normal operation. Coordinate with Fire Alarm System.

PART 24 - HEAT PUMPS SEQUENCE OF OPERATION:

24.1 Each unit shall be placed into the occupied/unoccupied mode based upon the building's Global Time Schedule

24.2 If communication is lost between the Global Time Schedule and the Heat Pump Controller, then the Heat Pump Controller shall be placed into the occupied mode until communication is restored.

24.3 A smoke detector shall be located in the return air stream of units greater than 2,000 cfm (5 tons or larger). If smoke is detected, then the system shall shutoff and an audio/visual alarm shall activate. Upon correction of the problem, the system shall be reset and shall return to normal operation. Coordinate with Fire Alarm System.

24.4 During the unoccupied mode, the heat pump shall not operate unless the space temperature falls outside unoccupied setpoints.

24.5 Provide all heat pump space temp sensors with an after-hours zone pushbutton override. If the BAS is in the unoccupied mode when the pushbutton override is activated, then the selected heat pumps shall be placed into operation for 1 hour (adj.). If the button is pushed again, the unit shall go back to the unoccupied mode.

24.6 During the occupied mode, the fan and compressor(s) shall stage, and cycle as required to satisfy space thermostat/sensor setpoint. Whenever heating or cooling is required, the unit's three-wire, two-way, two-position control valve shall open and prove prior to compressor operation. For units 2 tons and greater, the fan and compressor shall modulate speed to maintain setpoint. The unit shall automatically changeover from heating to cooling. When space temperature is satisfied the fan and compressor shall be off and the control valve shall be closed. To prevent short cycling a minimum of 5 minute delay when transitioning between heat and cool modes. Current sensor to monitor fan status.

24.7 The majority of heat pumps operate with a wall mounted wireless thermostat. The space temperature shall be set per the following modes. Winter – Dead band shall be 69°F - 73°F, Summer - 73°F - 77°F. Index the building heat pumps to winter mode starting October 15th (adj.) and summer mode starting April 15th (adj.). All unit setpoints and adjustable ranges shall be adjustable through the front end.

24.8 During the occupied mode, the space is unoccupied per the occupancy sensor, reset space temperature setpoint to temporary standby mode. Occupancy sensor standby mode setpoint shall be 3 deg F (adj.) above occupied cooling and 3 deg (adj.) below occupied heating temperature setpoint.

24.9 Economizer control for heat pumps:

24.9.1 Heat Pumps with economizer cooling capability are indicated on the plans. Heat Pumps shall perform as indicated above unless there is a call for cooling and the outside air temperature is below 58 deg-F.

24.9.2 Economizer: When outside air temperature is below 58 deg-F the economizer cycle shall be enabled. The heat pump compressor shall be disabled. The motorized dampers in the return, exhaust and outside air ductwork shall modulate to maintain space temperature setpoint.

24.9.3 The minimum OA damper shall be fully open during economizer operation.

PART 25 –EXHAUST FANS:

25.1 The building exhaust fans shall operate continuously in the occupied mode. In the unoccupied building mode fans shall be off.

25.2 Fan status shall be monitored using a current sensor.

25.3 Exhaust fan serving Janitor – 154 shall run continuously in occupied and unoccupied modes.

25.4 Interlock dishwasher exhaust fan operation with contactor on dishwasher such that fan is enabled when dishwasher is in operation. Fan shall continue to operate 30 min after dishwasher is disabled.

PART 26 – KITCHEN RANGEHOOD AND MAKE-UP AIR CONTROL SEQUENCES:

26.1 The range hoods exhaust systems for KH-X consist of an associated exhaust fan.

26.2 Exhaust Fan Control: Each hood shall be provided with hood mounted temperature sensor and control panel with fan on/auto switch and lighting on/off switch. Locate control panel recessed in block wall near kitchen hoods.

26.3 In the event that any hood temperatures rise above 95F (adj), all hood exhaust fan shall be activated. Additionally, if the hood is placed on the on position and hood temperatures are above 85F (adj), the exhaust fan shall operate.

26.4 Interlock hood fan operation with MAU-1. MAU-1 shall modulate gas valve and associate heat exchanger to maintain a 70 deg-F discharge air temperature.

PART 27 – KITCHEN REFRIGERATOR AND FREEZER:

27.1 Provide a wall-mounted temperature sensor in the walk-in refrigerator and freezer units to monitor temperature. If the temperatures exceed a pre-designated setpoint (adj.), an alarm shall be generated.

PART 28 – DOMESTIC WATER HEATER

28.1 The DDC System shall enable/disable the domestic hot water building circulating pump.

28.2 The DDC System shall monitor domestic hot water supply temperature at each heater.

PART 29 – MFD & IFD ROOMS:

29.1 Provide a temperature in room to monitor space temperature.

PART 30 – DUCTLESS MINI_SPLIT SYSTEMS:

30.1 Provide manufacturers required control wiring for split system equipment for stand-alone operation and space temperature control.

PART 31 – HVAC POINTS LIST:

RTU-X POINT LIST							
	BINARY			ANALOG			POINT DETAILS
	STATUS	ALARM	MAINT	POINT	HIGH ALARM	LOW ALARM	
Supply Air Fan		X		X			CFM
Supply Fan VFD		X		X			HZ
DX Coil DAT				X			Degrees
Hot-gas Reheat DAT				X			Degrees
Unit DAT				X		X < 40	Degrees
Space Temperature				X	X > 100	X < 40	Degrees
Space Temp Setpoint				X			Degrees
Space Humidity				X	X > 80		%RH
Space Humidity Setpoint				X			%RH
OA Enthalpy				X			BTU/LB
RA Enthalpy				X			BTU/LB
Space Average CO2				X			PPM
Return Air Temp.				X			Degrees
Outside Air Temp.				X			Degrees
Low Limit Thermostat		X					
RA Air Damp Pos.	X	X					% Open
OA Air Damp Pos.	X	X					% Open
Single Stage Compressor #X				X			On/Off
Variable Speed Compressor #X				X			% Capacity
Gas Heat				X			Stages
Filter Diff, Pressure				X	X > 0.5”		Delta P
Duct Smoke Detector		X					
Condensate Overflow		X					
END OF POINT LIST							

KITCHEN POINT LIST

	BINARY			ANALOG			FUNCTION DETAILS
	STATUS	ALARM	MAINT	POINT	HIGH ALARM	LOW ALARM	
Hood Exhaust Fan	X	X					On/Off
Hood Exhaust Temp				X	X		Degrees
Hood Lights	X						On/Off
MAU Status	X						On/Off
MAU Electric Heat	X						On/Off
MAU Fan	X						On/Off
MAU Discharge Air Temp				X	X	X	Degrees
MAU Filter				X	X		Delta P
END OF KITCHEN POINT LIST							

HEAT PUMP POINT LIST

	BINARY			ANALOG			POINT DETAILS
	STATUS	ALARM	MAINT	POINT	HIGH ALARM	LOW ALARM	
Compressor (s)	X	X					On/Off
Supply Fan	X	X					On/Off
Reversing Valve	X						
Space Temperature Setpoint				X			Degrees
Space Temperature				X	X	X	Degrees
Room CO2 (where indicated)				X			CO2
Occupancy Sensor	X						Enabled/ Disabled
Discharge Air Temperature				X			Degrees
Min OA Damper		X		X			% Open
Economizer OA Damper		X		X			% Open
Return Damper		X		X			% Open
Relief Damper		X		X			% Open
Mixed Air Temperature				X	X	X	Degrees
Smoke Detectors (where required)		X					
Condensate Overflow		X					
END OF POINT LIST							

MISC SYSTEM POINT LIST							
	BINARY			ANALOG			POINT DETAILS
	STATUS	ALARM	MAINT	POINT	HIGH ALARM	LOW ALARM	
MDF / IDF Temp				X			Degrees
Domestic WH	X						Degrees
Domestic WH Pump	X						On/Off
Freezer Temp				X	X > 0		Degrees
Cooler Temp				X	X > 40		Degrees
END OF POINT LIST							

END OF SECTION 250400

SECTION 260501 - GENERAL PROVISIONS - ELECTRICAL

PART 1 - GENERAL

1.1 The Instructions to Bidders, General and Special Conditions, and all other contract documents shall apply to the Contractor's work as well as to each of his Sub Contractor's work. Each Contractor is directed to familiarize himself in detail with all documents pertinent to this Contract. In case of conflict between these General Provisions and the General and/or Special Conditions, the affected Contractor shall contact the Engineer for clarification and final determination.

1.2 Each Contractor shall be governed by any alternates, unit prices and Addenda or other contract documents insofar as they may affect his part of the work.

1.3 The work included in this division consists of the furnishing of all labor, equipment, transportation, supplies, material, and appurtenances and performing all operations necessary for the satisfactory installation of complete and operating Electrical Systems indicated on the drawings and/or specified herein.

1.4 Any materials, labor, equipment, or services not mentioned specifically herein which may be necessary to complete or perfect any part of the Electrical Systems in a substantial manner, in compliance with the requirements stated, implied, or intended in the drawings and specifications, shall be included as part of this Contract. The Contractor shall give written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction; and any necessary items of work omitted a minimum of ten days prior to bid. In the absence of such written notice and by the act of submitting his bid, it shall be understood that the Contractor has included the cost of all required items in his bid, and that he will be responsible for the approved satisfactory functioning of the entire system without extra compensations.

1.5 It is not the intent of this Section of the Specifications to make any Contractor, other than the Construction Manager responsible to the Owner. All transactions such as submittal of shop drawings, claims for extra costs, requests for equipment or materials substitution, shall be routed through the Construction Manager to the Architect, then to the Engineer. Also, this Section of the Specifications shall not be construed as an attempt to arbitrarily assign responsibility of work, material, equipment or services to a particular trade or Contractor. Unless stated otherwise, the subdivision and assignment of work under the various sections shall be optional.

1.6 This section of the Specifications or the arrangement of the Contract Documents shall not be construed as an attempt to arbitrarily assign responsibility for work, material, equipment or services to a particular trade Contractor or Sub-Contractor. Unless stated otherwise, the subdivision and assignment of work under the various sections shall be the responsibility of the Contractor holding the Prime Contract.

1.7 It is the intent of this Contract to deliver to the Owners a "like new" project once work is complete. Although plans and specifications are complete to the extent possible, it shall be responsibility of the Contractors involved to remove and/or relocate or re-attach any existing or new systems which interfere with new equipment or materials to be installed by other trades without additional cost to the Owner.

1.8 In general, and to the extent possible, all work shall be accomplished without interruption of the existing facilities' operations. Each Contractor shall advise the Architect, Owner, and Engineer in writing at least one week prior to the deliberate interruption of any services. The Owners shall be advised of the exact time that interruption will occur and the length of time the interruption will occur. Failure to comply with this requirement may result in complete work stoppage by the Contractors involved until a complete schedule of interruptions can be developed. Contractor will not be entitled to additional compensation due to work stoppage mandated by unscheduled interruption.

1.9 Whenever utilities are interrupted, either deliberately or accidentally, the Contractor shall work continuously to restore said service. The Contractor shall provide tools, materials, skilled journeymen of his own and other trades as necessary, premium time as needed and coordination with all applicable utilities, including payment of utility company charges (if any), all without requests for extra compensation to the Owner, except where otherwise provided for in the contract for the work. The Contractor shall abide by the requirements of the Special Conditions.

1.10 Definitions and Abbreviations

A. Prime Contractor - The Contractor who has been engaged by the Owner in a contractual relationship to accomplish the work.

B. Contractor - Any Contractor whether bidding, proposing, or working independently or under the supervision of a Prime Contractor, Construction Manager and who installs any type of Electrical Work as specified in the Contract Documents.

C. Electrical Contractor - Any Contractor whether bidding or working independently or under the supervision of a Construction Manager, that is: the one holding the Prime Contract and who installs any type of Electrical work, such as: power, lighting, television, telecommunications, data, fiber optic, intercom, fire detection and alarm, security, video, underground or overhead electrical, etc.

D. Electrical Sub-Contractor - Each or any Contractor contracted to, or employed by, the Electrical Contractor for any work required by the Electrical Contractor.

E. Engineer - The Consulting Mechanical-Electrical Engineer either consulting to the Owner, Architect, or Other, etc. In this case: CMTA, Inc., Consulting Engineers.

F. Architect - The Architect of Record for the project.

G. Contract Documents - All documents pertinent to the quality and quantity of work to be performed on this project. Includes, but not limited to: Plans, Specifications, Instructions to Bidders, General and Special Conditions, Addenda, Alternates, Lists of Materials, Lists of Sub-Contractors, Unit Prices, Shop Drawings, Field Orders, Change Orders, Cost Breakdowns, Schedules of Value, Periodical Payment Requests, Construction Manager's Assignments, Architect's Supplemental Instructions, Construction Contract with Owner, etc.

H. Bidder/Proposer - Any person, agency or entity submitting a proposal to any person, agency, or entity for any part of the work required under this contract.

I. The Project - All of the work required under this Contract.

J. Furnish - Deliver to the site in good condition and turn over to the Contractor who is to install.

K. Provide - Furnish and install complete, tested, and ready for operation.

L. Install - Install equipment furnished by others in complete working order.

M. Indicated - Listed in the Specifications, shown on the Plans or Addenda thereto.

N. Basis of Design (BOD): Documentation of primary thought processes and assumptions behind design decisions made to meet design intent. Describes systems, components, conditions, and methods chosen to meet intent.

O. Monitoring: Recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or trending capabilities of control systems.

P. Start-up: The activities where systems or equipment are initially tested and operated. Start-up is completed prior to functional testing.

Q. Vendor: Supplier of equipment.

R. Typical or Typ- Where indicated repeat this work, method or means each time the same or similar condition occurs whether indicated or not.

S. ADA - Americans with Disabilities Act.

T. ANSI - American National Standards Institute.

U. ASA – American Standards Association.

V. ASTM – American Society for Testing Materials.

W. ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers.

X. BAS – Building Automation System.

Y. BICSI – Building Industry Consulting Services International

Z. CM – Construction Manager

AA. EE – Electrical Contractor

BB. FCC – United States Federal Communications Commission

CC. IECC – International Energy Conservation Code

DD. IEEE – Institute of Electrical and Electronics Engineers.

EE. ISO – International Standards Organization.

FF. NEC – National Electrical Code (NFPA 70).

GG. NECA – Standards for Installation.

HH. NEMA - National Electrical Manufacturers Association.

II. NESC – National Electrical Safety Code.

JJ. NFPA - National Fire Protection Association.

KK. OSHA - Office of Safety and Health Administration.

LL. TIA – Telecommunications Industry Association

MM. RFI – Request for Information

NN. RIO – Rough-in Only

OO. UL - Underwriters Laboratories, Inc.

PP. UON – Unless otherwise noted.

1.11 Note: Any reference within these specifications to a specific entity, i.e., "Electrical Contractor" is not to be construed as an attempt to limit or define the scope of work for that entity or assign work to a specific trade or contracting entity. Such assignments of responsibility are the responsibility of the Contractor or Construction Manager holding the prime contract, unless otherwise provided herein.

1.12 Required Notices: Ten days prior to the submission of a proposal, each proposer shall give written notice to the Engineer of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction; and any necessary items of work omitted. In the absence of such written notice, Proposers signify that they have included the cost of all required items in the proposal and that the Proposer will be responsible for the safe and satisfactory operation of the entire system.

1.13 In each of the specifications and drawings referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.14 SYSTEM COMMISSIONING

A. Section 019113 requires the engagement of a Commissioning Authority to document the completion of the Mechanical, Fire Protection, Plumbing, Electrical, Electronic Safety and Security, and associated Control Systems for the project. Section 019113 defines the roles and responsibilities of each member of the commissioning team.

B. Comply with the requirements of Section 019113 for the commissioning of the various building systems.

PART 2 - INTENT AND INTERPRETATION

2.1 It is the intent of these specifications and all associated drawings that the Contractor provide finished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete, tested and ready for operation."

2.2 Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.

2.3 It is the intention of the Contract Documents to call for a complete and operational system, including all components, accessories, finish work, etc. as necessary for trouble free operation, tested and ready for operation. Anything that may be required, implied, or inferred by the Contract Documents shall be provided and included as part of the Bid.

2.4 All Contractors and Vendors providing a bid for this project shall review the Plans and Specifications and determine any modifications and/or adjustments necessary relative to the proposed equipment and materials with specific manufacturer’s installation requirements. Include in the bid any necessary installation methods, features, options, accessories, etc. necessary to install the proposed equipment and materials, regardless of whether used as basis of design or being offered as a substitution in accordance with the specific manufacturer’s installation requirements whether specifically detailed or not within the Plans and Specifications.

2.5 Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.

2.6 The Bidder/Proposer shall completely review the Contract Documents. Any interpretation as to design intent or scope shall be provided by the Engineer / Architect. Should an interpretation be required, the Bidder/Proposer shall request a clarification not less than ten (10) days prior to the submission of the proposal so that the condition may be clarified by Addendum. In the event of any conflict, discrepancy, or inconsistency develops; the interpretation of the Engineer shall be final.

2.7 The Contractor shall give written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction; and any necessary items of work omitted a minimum of ten (10) days prior to bid. In the absence of such written notice and by the act of submitting a bid, it shall be understood that the Contractor has included the cost of all required items in the bid, and that will be responsible for the approved satisfactory

PART 3 - ELECTRICAL DRAWINGS AND SPECIFICATIONS

3.1 The drawings are diagrammatic only and indicate the general arrangement of the systems and are to be followed insofar as possible. If deviations from the layouts are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted in writing to the Engineer for approval before proceeding with the work. The Contract Drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the

systems. Contractors shall, however, anticipate that additional offsets may be required and submit their bid accordingly.

3.2 The drawings and specifications are intended to supplement each other. No Contractor, bidder, proposer, or supplier shall take advantage of conflict between them, or between parts of either, but should this condition exist, the Contractor or supplier shall request a clarification of the condition at least ten days prior to the submission of bids so that the condition may be clarified by Addendum. In the event that such a condition arises after work is started, the interpretation of the Engineer shall be the determining factor. In all instances, unless modified in writing and agreed upon by all parties thereto, the Contract to accomplish the work shall be binding on the affected Contractor.

3.3 The drawings and specifications shall be considered to be cooperative and complimentary and anything appearing in the specifications which may not be indicated on the drawings or conversely, shall be considered as part of the Contract and must be executed the same as though indicated by both.

3.4 This Contractor shall make all his own measurements in the field and shall be responsible for correct fitting. He shall coordinate this work with all other branches of work in such a manner as to cause a minimum of conflict or delay.

3.5 The Engineer shall reserve the right to make minor adjustments in location of conduit, fixtures, outlets, switches, etc., where he considers such adjustments desirable in the interest of concealing work or presenting a better appearance.

3.6 Each Contractor shall evaluate ceiling heights called for on Architectural Plans. Where the location of Electrical equipment may interfere with ceiling heights, the Contractor shall call this to the attention of the Engineer in writing prior to making the installation. Any such changes shall be anticipated and requested sufficiently in advance so as to not cause extra work on the part of the Contractor or unduly delay the work.

3.7 Should overlap of work between the various trades become evident, this shall be called to the attention of the Engineer. In such event neither trade shall assume that he is to be relieved of the work which is specified under his branch until instructions in writing are received from the Engineer.

3.8 The Electrical drawings are intended to show the approximate location of equipment, materials, etc. Dimensions given in figures on the drawings shall take precedence over scaled dimensions and all dimensions whether given in figures or scaled shall be verified in the field. In case of conflict between small- and large-scale drawings, the larger scale drawings shall take precedence.

3.9 The Electrical Contractor and his Sub-Contractors shall review all drawings in detail as they may relate to his work (structural, architectural, site survey, mechanical, etc.). Review all drawings for general coordination of work, responsibilities, ceiling clearances, wall penetration points, chase access, fixture elevations, etc. Make any pertinent coordination or apparent conflict comments to the Engineers at least ten (10) days prior to bids, for issuance of clarification by written addendum.

3.10 Where on any of the drawings a portion of the work is drawn out and the remainder is indicated in outline, or not indicated at all, the parts drawn out shall apply to all other like portions of the work. Where ornament or other detail is indicated by starting only, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to all other similar parts of the work, unless otherwise indicated.

3.11 Special Note: Always check ceiling heights indicated on Drawings and Schedules and ensure that these heights may be maintained after all mechanical and electrical equipment is installed. If a conflict is apparent, notify the Engineer in writing for instructions.

PART 4 - EXAMINATION OF SITE AND CONDITIONS

4.1 Each Contractor shall inform himself of all of the conditions under which the work is to be performed, the site of the work, the structure of the ground, the obstacles that may be encountered, the availability and location of necessary facilities and all relevant matters concerning the work. All Contractors shall carefully examine all Drawings and Specifications and inform themselves of the kind and type of materials to be used throughout the project and which may, in any way, affect the execution of his work.

4.2 Each Contractor shall fully acquaint himself with all existing conditions as to ingress and egress, distance of haul from supply points, routes for transportation of materials, facilities and services, availability of temporary or permanent utilities, etc. The Contractor shall include in his work all expenses or disbursements in connection with such matters and conditions. Each Contractor shall verify all work shown on the drawings and conditions at the site and shall report in writing to the Engineer ten (10) days prior to bid, any apparent omissions, or discrepancies in order that clarifications may be issued by written addendum. No allowance is to be made for lack of knowledge concerning such conditions after bids are accepted.

4.3 The Electrical Contractor is required to provide coordination drawings, data, and collaboration for all aspects of his work in accordance with the general and special conditions – Divisions 20, 21, 22, 23, 25, 26, 27 and 28 and the Construction Manager’s procedures.

PART 5 - EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS

5.1 When any Contractor requests review of substitute materials and/or equipment, and when under an approved formal alternate proposal, it shall be understood and agreed that such substitution, if approved, will be made without additional cost regardless of changes in connections, spacing, service, mounting, etc. In all cases where substitutions affect other trades, the Contractor offering such substitutions shall advise all such Contractors of the change and shall reimburse them for all necessary changes in their work. Any drawings, Specifications, Diagrams, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense. Special Note: Review of Shop Drawings by the Engineer does not absolve the Contractor of this responsibility.

5.2 References in the specifications to any article, device, product, material, fixture, form, or type of construction by name, make, or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. Each Contractor, in such cases, may, at his option, use any article, device, product, material, fixture, form, or type of construction which in the judgment of the Engineer is equivalent to that specified, provided the provisions of Paragraph 5.1 immediately preceding are met. Substitutions shall be submitted to the Engineer a minimum of ten (10) days prior to bid date for approval to bid in written form through addenda or other method selected by the Engineer. If prevailing laws of cities, towns, states, or countries are more stringent than these specifications regarding such substitutions, then those laws shall prevail over these requirements.

5.3 Wherever any equipment and material is specified exclusively only such items shall be used unless substitution is accepted in writing by the engineers.

5.4 Each Contractor shall furnish along with his proposal a list of specified equipment and materials which he proposes to provide. Where several makes are mentioned in the Specifications and the Contractor fails to state which, he proposes to furnish, the Engineer shall have the right to choose any of the makes mentioned without change in price.

PART 6 - SINGLE SOURCE RESPONSIBILITY AND OBSOLETE EQUIPMENT

6.1 Except where specifically noted otherwise, all equipment supplied by the Contractor shall be the standard products of a single manufacturer of known reputation and experience in the industry. Only equipment, components, and accessories in current production for at least five (5) years beyond the completion date of this system shall be used and installed. Any equipment found to be obsolete or not in future production will be removed and replaced at Contractor's expense. This includes all equipment, materials, and labor.

PART 7 - CODES, RULES, PERMITS, FEES, REGULATIONS, ETC.

7.1 The Contractor shall give all necessary notices, obtain, and pay for all permits, government sales taxes, fees, and other costs including utility connections or extensions, in connection with his work. As necessary, he shall file all required plans, utility easement requests and drawings, survey information on line locations, load calculations, etc., prepare all documents and obtain all necessary approvals of all utility and governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver same to the Engineer before request for acceptance and final payment for the work.

7.2 Ignorance of Codes, Rules, regulations, utility company requirements, laws, etc., shall not diminish or absolve Contractor's responsibilities to provide and complete all work in compliance with such.

7.3 The Contractor shall include in the work, without extra cost, any labor, materials, services, apparatus, or drawings required in order to comply with all applicable laws, ordinances rules and regulations, whether or not shown on drawings and/or specified.

7.4 All materials furnished and all work installed shall comply with the current edition of the National Electrical Codes, National Fire Codes of the National Fire Protection Association, the requirements of local utility companies, and with the requirements of all governmental agencies or departments having jurisdiction.

7.5 All material and equipment for the electrical systems shall bear the approval label, or shall be listed by the Underwriters' Laboratories, Incorporated. Listings by other testing agencies may be acceptable with written approval by the Engineer.

7.6 All electrical work is to be constructed and installed in accordance with plans and specifications which have been approved in their entirety and/or reflect any changes requested by the State Fire Marshal, as applicable or required. Electrical work shall not commence until such plans are in the hands of the Electrical Contractor.

7.7 The Contractor shall insure that his work is accomplished in accord with OSHA Standards and any other applicable government requirements.

7.8 Where conflict arises between any code and the plans and/or specifications, the code shall apply except in the instance where the plans and specifications exceed the requirements of the code. Any changes required as a result of these conflicts shall be brought to the attention of the Engineer at least ten working days prior to bid date, otherwise the Contractor shall make the required changes at his own expense. The provisions of the codes constitute minimum standards for wiring methods, materials, equipment and construction and compliance therewith will be required for all electrical work, except where the drawings and specifications require better materials, equipment, and construction than these minimum standards, in which case the drawings and specifications shall be the minimum standards.

PART 8 - COST SUPERVISION OF WORK

8.1 Each Contractor and Sub-Contractors shall personally supervise the work or have a competent superintendent on the project site at all times during progress of the work, with full authority to act for him in matters related to the project.

PART 9 - BREAKDOWNS

9.1 Within thirty days after acceptance of the Contract, each Contractor is required to furnish to the Engineer one copy of a detailed cost breakdown on each respective area of work. These cost breakdowns shall be made on forms provided or approved by the Engineer or Architect. Payments will not be made until satisfactory cost breakdowns are submitted. Refer to Division 0 and 1 specification sections for additional requirements.

9.2 In addition to cost breakdowns by specification section, the following shall also be provided: Material and labor shall be listed separately. These items are in addition to items listed in front-end specifications. Pay special attention to required withholding percentages for startup, testing, documentation, acceptance, owner training, etc. The breakdown shall be minimally as follows:

1. Permitting
2. Mobilization
3. Electrical Shop Drawings/Submittals
4. Electrical Coordination Drawings
5. Temporary Power
6. Interior Lighting Materials & Labor
7. Exterior Lighting Materials & Labor
8. Lighting Controls Materials & Labor
9. Electrical Distribution (Switchgear) Materials & Labor
10. Feeders Materials & Labor
11. Branch Circuiting Materials & Labor
12. Service Grounding Materials & Labor
13. Surge Suppression Materials & Labor
14. Electrical Devices Materials & Labor
15. Ladder/Cable Trays Materials & Labor
16. Fiber/Communication Duct Banks Materials & Labor
17. Fire Alarm Materials & Labor
18. Low-Voltage Data/Voice Cabling Materials & Labor
19. Low-voltage Data/Voice Equipment Materials & Labor
20. Generator Materials & Labor
21. CATV Equipment and Cabling Materials & Labor
22. Security Equipment and Cabling Materials & Labor
23. Spare lamps and ballasts
24. Fire Alarm System Startup, Testing, & Verification (shall equal 5% of Equipment Value)
25. Electrical Distribution Equipment Startup, Testing, & Verification (shall equal 2.5% of Equipment Value)
26. Lighting and Lighting Controls Startup, Testing, & Verification (shall equal 2.5% of Equipment Value)
27. Low Voltage Systems Startup, Testing, & Verification (shall equal 5% of Equipment Value)
28. Owner Training & Acceptance
29. Punchlist
30. As-Built/Record Drawings & Acceptance
31. O&M Manuals & Acceptance
32. Warranty
33. Demobilization

PART 10 - GUARANTEES AND WARRANTIES

10.1 Each Contractor shall unconditionally guarantee all equipment, apparatus, materials, and workmanship entering into this Contract to be the best of its respective kind and shall replace all parts at his own expense, which fail or are deemed defective within one year from final acceptance of the work by the Engineer. The effective date of completion of the work shall be the date each or any portion of the work is accepted by the Engineer and Owner's Statement of Substantial Completion.

10.2 Items of equipment which have longer guarantees, as called for in these specifications or as otherwise offered by the manufacturer, such as batteries, transformers, etc., shall have warranties and guarantees completed in order, and shall be in effect at the time of final acceptance of the work by the Engineer. The Contractor shall present the Engineer with such warranties and guarantees at the time of final acceptance of the work. The Owner reserves the right to use equipment installed by the Contractor prior to date of final acceptance. Such use of equipment shall in no way invalidate the guarantee except that Owner shall be liable for any damage to equipment during this period due to negligence of his operator or other employee.

10.3 The Warranties specified in this, and other Articles shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

10.4 All light fixtures shall have a five (5) year unconditional warranty. (Parts, Labor, and Travel).

10.5 Provide all warranty certificates to Owner. All warranties begin starting at the substantial completion date, submit warranty certificates accordingly.

PART 11 - INSPECTION, APPROVALS AND TESTS

11.1 Before requesting a final review of the installation from the Architect and/or Engineer, the Contractor shall thoroughly inspect his installation to assure that the work is complete in every detail and that all requirements of the Contract Documents have been fulfilled. Failure to accomplish this may result in charges from the Architect and/or Engineers for unnecessary and undue work on their part.

11.2 Owner's and Engineer's inspections: Two (2) inspections will be held to generate and then review punchlist items. All site visits thereafter shall be billed to the Contractor at the Engineer's standard hourly rates.

11.3 The Contractor shall provide as a part of this contract electrical inspection by a competent Electrical Inspection Agency, licensed to provide such services. The name of this agency shall be included in the list of materials of the Form of Proposal by the Contractor. All costs incidental to the provision of electrical inspections shall be borne by the Electrical Contractor.

11.4 The Contractor shall advise each Inspection Agency in writing (with an information copy of the correspondence to the Architect and/or Engineer) when he anticipates commencing work. Failure of the Inspection Agency to inspect the work in the stage following and submit the related reports may result in the Contractor's having to expose concealed work not so inspected. Such exposure will be at the expense of the responsible Contractor.

11.5 Inspections shall be scheduled for rough as well as finished work. The rough inspections shall be divided into as many inspections as may be necessary to cover all roughing-in without fail. Report of each such inspection visit shall be submitted to the Architect, Engineer, and the Contractor within three days of the inspection.

11.6 Approval by an Inspector does not relieve the Contractor from the responsibilities of furnishing equipment having a quality of performance equivalent to the requirements set forth in these plans and specifications. All work under this contract is subject to the review of the Architect and/or Engineer, whose decision is binding.

11.7 Before final acceptance, the Contractor shall furnish three (3) copies of the certificates of final approval by the Electrical Inspector (as well as all other inspection certificates) to the Engineer with one (1) copy of each to the appropriate government agencies, as applicable. Final payment for the work shall be contingent upon completion of this requirement.

11.8 The Contractor shall test all wiring and connections for continuity and grounds before equipment and fixtures are connected, and when indicated or required, demonstrate by Megger Test the insulation resistance of any circuit or group of circuits. Where such tests indicate the possibility of faulty insulation, locate the point of such fault, pull out the defective conductor, replacing same with new and demonstrate by further test the elimination of such defect.

PART 12 - CHANGES IN ELECTRICAL WORK

12.1 REFER TO GENERAL AND SPECIAL CONDITIONS.

PART 13 - CLAIMS FOR EXTRA COST

13.1 REFER TO GENERAL AND SPECIAL CONDITIONS.

PART 14 - SURVEYS, MEASUREMENTS AND GRADES

14.1 The Contractor shall lay out his work and be responsible for all necessary lines, levels, elevations, and measurements. He must verify the figures shown on the drawings before laying out the work and will be held responsible for any error resulting from his failure to do so.

14.2 The Contractor shall base all measurements, both horizontal and vertical from established benchmarks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work.

14.3 Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications, he shall notify the Engineer thru normal channels of job communication and shall not proceed with his work until he has received instructions from the Engineer.

PART 15 - UTILITY COMPANY REQUIREMENTS

15.1 The Contractor shall provide the local utility company with a drawing produced by a licensed Land Surveyor (or a licensed Engineer) in the State of Kentucky and acceptable to the utility that locates the centerline of the primary duct. Coordinate further requirements with utility company.

15.2 Contact the utility company for specifics on construction of pads, conduit, etc., prior to bidding the work and determine all their requirements. All work shall be in accordance with their standards.

15.3 The electrical contractor is responsible for all fees, permit costs, etc., from the electrical utility, data, telephone, and cable TV companies. This includes any cost associated with the electrical service extension.

15.4 Each contractor, prior to bidding the work, is to contact the utility companies (electric, data, telephone, and cable TV) and determine the exact points of extension of all underground services in the field with a representative of each utility company. Also, obtain construction details on manholes, transformer pads, pedestal stub-ups, etc., from each utility company as applicable. Extension points indicated on the plans are approximate and are given for the bidder's information only.

PART 16 - TEMPORARY SERVICES

16.1 The Contractor shall arrange for temporary electrical and other services which he may require to accomplish his work. In the absence of other provisions in the contract, the Contractor shall provide for his own temporary services of all types, including the cost of connections, utility company fees, construction, removal, etc., in his bid.

16.2 All temporary services shall be removed by Contractor prior to acceptance of work.

PART 17 - TEMPORARY USE OF EQUIPMENT

17.1 The permanent electrical equipment, (except lighting), when installed, may be used for temporary services, subject to an agreement among the Contractors involved, the Owner, and with the consent of the Engineer. Should the permanent systems be used for this purpose, each Contractor shall pay for all temporary connections required and any replacements required due to damage without cost, leaving the equipment and installation in "as new" condition. The Contractor may be required to bear utility costs, user fees, etc.

17.2 Permission to use the permanent equipment does not relieve the Contractors who utilize this equipment from the responsibility for any damages to the building construction and/or equipment which might result because of its use.

PART 18 - MATERIALS AND WORKMANSHIP

18.1 All electrical equipment, materials and articles incorporated in the work shall be new and of comparable quality to that specified. All workmanship shall be first-class and shall be performed by electricians skilled and regularly employed in their respective trades. The Contractor shall determine that the equipment he proposes to furnish can be brought into the building(s) and installed within the space available. All equipment shall be installed so that all parts are readily accessible for inspection, maintenance, replacement, etc. Extra compensation will not be allowed for relocation of equipment for accessibility or for dismantling equipment to obtain entrance into the building(s).

18.2 All conduit and/or conductors shall be concealed in or below walls, below floors or above ceilings, unless otherwise noted. All fixtures, devices and wiring required shall be installed to make up complete systems as indicated on the drawings and specified herein. Raceways shall not be placed within foundation walls and footings.

18.3 All materials, where applicable, shall bear Underwriters' Laboratories label or that of another Engineer approved testing agency, where such a standard has been established.

18.4 Each length of conduit, wireway, duct, conductor, cable, fitting, fixture, and device used in the electrical systems shall be stamped or indelibly marked with the makers mark or name.

18.5 All electrical equipment shall bear the manufacturer's name and address and shall indicate its electrical capacity and characteristics.

18.6 All electrical materials, equipment and appliances shall conform to the latest standards of the National Electric Manufacturers Association (NEMA) and the National Board of Fire Underwriters (NBFU) and shall be approved by the Owner's insuring agency if so required.

18.7 Comply with National Electrical Contractors Association (NECA) performance standards that are published as National Electrical Installation Standards (NEIS).

18.8 All applicable equipment and devices provided shall meet all FCC requirements and restrictions.

PART 19 - QUALIFICATIONS OF WORKMEN

19.1 All electrical contractors bidding this project must have been a licensed company for a minimum of three (3) years to qualify to bid this project. Individual employee experience does not supersede this requirement.

19.2 All subcontractors bidding the electrical work must have completed one project of 70% this subcontract cost size and two projects of 50% this subcontract cost size.

19.3 All electrical work shall be accomplished by qualified workmen competent in the area of work for which they are responsible. Untrained and incompetent workmen as evidenced by their workmanship shall be relieved of their responsibilities in those areas. The Engineer shall reserve the right to determine the quality of workmanship of any workman and unqualified or incompetent workmen shall refrain from work in areas not satisfactory to him. Requests for relief of a workman shall be made through the normal channels of responsibility established by the Architect or the contract document provisions.

19.4 All electrical work shall be accomplished by Journeymen electricians under the direct supervision of a licensed Electrician. All applicable codes, utility company regulations, laws and permitting authority of the locality shall be fully complied with by the Contractor.

19.5 Special electrical systems, such as Fire Detection and Alarm Systems, Telecommunications or Data Systems, Video Systems, Special Electronic Systems, Control Systems, etc., shall be installed by workmen normally engaged or employed in these respective trades. As an exception to this, where small amounts of such work are required and are, in the opinion of the Engineer, within the competency of workmen directly employed by the Contractor involved, they may be provided by this Contractor.

PART 20 - CONDUCT OF WORKMEN

20.1 The Contractor shall be responsible for the conduct of all workmen under his supervision. Misconduct on the part of any workmen to the extent of creating a safety hazard, or endangering the lives and property of others, shall result in the prompt relief of that workman. The consumption or influence of alcoholic beverages, narcotics or illegally used controlled substances on the jobsite is strictly forbidden.

PART 21 - COOPERATION AND COORDINATION BETWEEN TRADES

21.1 The Contractor is expressly directed to read the General Conditions and all detailed sections of these specifications for all other trades and to study all drawings applicable to his work, including Architectural, Mechanical, Structural, and other pertinent Drawings, to the end that complete coordination between trades will be affected.

21.2 Refer to Coordination Among Trades, Systems Interfacing and Connection of Equipment Furnished by Others section of these Specifications for further coordination requirements. The Contractor is responsible for the correct location of all rough-in and connections at every piece of equipment. Work not correctly located shall be relocated at the Contractor's expense.

21.3 Where any work is to be installed in close proximity to, or will interfere with work of other trades, each shall cooperate in working out space conditions to make a satisfactory adjustment. If so directed by the Engineer, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than ¼" = 1'-0", clearly indicating how his work is to be installed in relation to the work of other trades, or so as not to cause any interference with work of other trades. He shall make the necessary changes in his work to correct the condition without extra charge.

21.4 The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

PART 22 - PROTECTION OF EQUIPMENT

22.1 The Contractor shall be entirely responsible for all material and equipment furnished by him in connection with his work and special care shall be taken to properly protect all parts thereof from damage during the construction period. Such protection shall be by a means acceptable to the Engineer. All rough-in conduit shall be properly plugged or capped during construction in a manner approved by the Engineer. Equipment damaged while stored on site either before or after installation shall be repaired or replaced (as determined by the Engineer) by the responsible Contractor. Electrical equipment exposed to the weather shall be replaced by the Contractor at his expense.

PART 23 - SCAFFOLDING, RIGGING AND HOISTING

23.1 The Contractor shall furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. All such temporary appurtenances shall be set up in strict accord with OSHA Standards and Requirements. Remove same from premises when no longer required.

PART 24 - CONCRETE WORK

24.1 The Contractor shall be responsible for the provision of all concrete work required for the installation of any of his systems or equipment. If this work is provided by another trade, it will not relieve the Electrical Contractor of his responsibilities relative to dimensions, quality of workmanship, locations, etc. In the absence of other concrete specifications, all concrete related to Electrical work shall be 3000 PSI minimum compression strength at 28 days curing and shall conform to the standards of the American Concrete Institute Publication ACI-318. Heavy equipment shall not be set on pads for at least seven days after pour.

24.2 All concrete pads shall be complete with all pipe sleeves, embeds, anchor bolts, reinforcing steel, concrete, etc., as required. Pads larger than l8" in width shall be reinforced with minimum #4 round bars on 6" centers both ways. All reinforcing steel shall be per ASTM requirements, tied properly, lapped 18 bar diameters, and supported appropriately up off form, slab, or underlayment. Bars shall be approximately 3" above the bottom of the pad with a minimum 2" cover. All parts of pads and foundations shall be properly rodded or vibrated. If exposed parts of the pads and foundations are rough or show honeycomb after removing forms properly adhered repairs shall be made. If structural integrity is violated, the concrete shall be replaced. All surfaces shall be rubbed to a smooth finish.

24.3 Special Note: All pads and concrete lighting standard bases shall be crowned slightly so as to avoid water ponding beneath equipment.

24.4 In general, concrete pads for small equipment shall extend 6" beyond the equipment's base dimensions. For large equipment with service access panels, extend pads l8" beyond base or overall dimensions to allow walking and servicing space at locations requiring service access.

24.5 Exterior concrete pads shall be 4" minimum above grade and 4" below grade on a tamped 4" dense grade rock base unless otherwise noted or required by utility company. Surfaces of all foundations and bases shall have a smooth finish with three-quarter inch radius or chamfer on exposed edges, troweled or rubbed smooth. All exterior pads shall be crowned approximately 1/8" per foot, sloping from center for drainage.

PART 25 - SMOKE AND FIRE PROOFING

25.1 The Contractor shall not penetrate rated fire walls, ceilings or floors with conduit, cable, bus duct, wireway or other raceway system unless all penetrations are protected in a code compliant manner which maintains the rating of the assembly. Smoke and fire stop all openings made in walls, chases, ceiling, and floors. Patch all openings around conduit, wireway, bus duct, etc., with appropriate type material to smoke stop walls and provide needed fire rating at fire walls, ceilings, and floors. Smoke and fire proofing materials and method of application

shall be approved by the local authority having jurisdiction. Refer to architectural plans and specifications for further requirements.

25.2 Contractor to provide heat detectors in the area of construction with complete fire detection until fire alarm system is operational and construction is complete.

25.3 Firestopping materials and installation shall be by a single source through-out the project, by all trades.

25.4 All fire-stopping assemblies must be UL listed. Provide shop drawings indicating penetration detail for each type of wall and floor construction. Shop drawings must be specific for each individual type (i.e., one-hour fire rated gypsum wall board with insulated metal pipe penetration.) and must indicate a UL listing for the complete fire-stopping assembly.

25.5 3M fire protection products are listed below. Equivalent products may be submitted if they are UL listed.

25.6 All fire-stopping shall be applied by a Contractor who is certified by the manufacturer of the fire-stopping product for installation of the product.

25.7 Fire-stopping materials to include but not limited to the following:

A. 3M fire barrier FS-195 wrap/strip.

B. 3M fire barrier CP 25 caulk.

C. 3M fire barrier MP moldable putty.

D. 3M fire barrier RC-1 restricting collar with steel hose clamp.

E. 3M fire barrier damming materials.

F. 3M fire barrier CS-195 composite sheet.

G. 3M fire barrier fire dam 150 caulk.

H. Steel sleeves.

I. Hilti Speed Sleeves.

PART 26 - QUIET OPERATION, SUPPORTS, VIBRATION AND OSCILLATION

26.1 All work shall operate under all conditions of load without any objectionable sound or vibration, the performance of which shall be determined by the Engineer. Noise from moving machinery or vibration noticeable outside of room in which it is installed, or annoyingly noticeable noise or vibration inside such room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Engineer shall be corrected in an approved manner by the Contractor (or Contractors responsible) at his expense.

26.2 All equipment subject to vibration and/or oscillation shall be mounted on vibration supports suitable for the purpose of minimizing noise and vibration transmission and shall be isolated from external connections such as piping, ducts, etc., by means of flexible connectors, vibration absorbers or other approved means. Surface mounted equipment such as panels, switches, etc., shall be affixed tightly to their mounting surface.

26.3 The Contractor shall provide supports for all equipment furnished by him using an approved vibration isolating type as needed. Supports shall be liberally sized and adequate to carry the load of the equipment and the loads of attached equipment, piping, etc. All equipment shall be securely fastened to the structure either directly or indirectly through supporting members by means of bolts or equally effective means. No work shall depend on the supports or work of unrelated trades unless specifically authorized in writing by the Architect or Engineer.

PART 27 - WELDING

27.1 The Contractor shall be responsible for quality of welding done by his organization and shall repair or replace any work not done in accordance with the Architect's or structural Engineer's specifications for such work. If required by the Engineer, the responsible Contractor shall cut at least three welds during the job for X-raying and testing. These welds are to be selected at random and shall be tested as a part of the responsible Contractor's work. Certification of these tests and X-rays shall be submitted, in triplicate, to the Engineer. In case a faulty weld is discovered, the Contractor shall be required to furnish additional tests and corrective measures until satisfactory results are obtained.

PART 28 - ACCESSIBILITY

28.1 The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in partitions and above suspended ceilings for the proper installation of his work. He shall cooperate with the Construction Manager and all other Contractors whose work is in the same space and shall advise each Contractor of his requirements. Such spaces and clearances shall be kept to the minimum size required to ensure adequate clearance and access.

28.2 The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include but not be limited to junction boxes, pull boxes, contactors, panels, disconnects, controllers, switchgear, etc. Minor deviations from drawings may be made to allow for better accessibility, and any change shall be approved where the equipment is concealed.

28.3 Each Contractor shall provide (or arrange for the provision by other trades) the access panels for each concealed junction box, pull box, fixtures or electrical device requiring access or service as shown on Engineer's plans or as required. Locations of these panels shall be identified in sufficient time to be installed in the normal course of work. All access panels shall be installed in accord with the Architect's standards for such work. In the absence of such specifications, at a minimum such work shall comply with the specifications below. All locations for access panels which are not specifically indicated on the drawings shall be submitted to and approved by the architect prior to ordering.

28.4 Access Doors; in Ceilings or Walls:

A. In mechanical, electrical, or service spaces: 14-gauge aluminum brushed satin finish, 1" border.

B. In finished areas: 14-gauge primed steel with 1" border to accept the architectural finishes specified for the space. Confirm these provisions with the Architect prior to obtaining materials or installing any such work.

C. In fire or smoke rated partitions, access doors shall be provided that equal or exceed the required rating of the construction they are mounted in.

PART 29 - RESTORATION OF NEW OR EXISTING SHRUBS, PAVING, ETC.

29.1 The Contractor shall replace to their original condition all paving, curbing surfaces, drainage ditches, structures, fences, shrubs, existing or new building surfaces and appurtenances, and any other items damaged or removed by his operations. Replacement and repairs shall be in accordance with good construction practice and shall match materials employed in the original construction of the item to be replaced. All repairs shall be to the satisfaction of the Engineer, and in accord with the Architect's standards for such work, as applicable. Patchwork on new construction will not be accepted.

PART 30 - MAINTENANCE OF EXISTING UTILITIES AND LINES

30.1 The locations of all piping, conduits, cables, utilities, and manholes existing, or otherwise, that come within the contract construction site, shall be subject to continuous uninterrupted maintenance with no exception unless the Owner of the utilities grants permission to interrupt same temporarily, if need be. Provide one week's written notice to Engineer, Architect and Owner prior to interrupting any utility service or line. Also see Part 1 - GENERAL, of this specification.

30.2 Known utilities and lines as available to the Engineer are shown on the drawings. However, it is additionally required that, prior to any excavation being performed, each Contractor ascertain and mark all utilities or lines that would be endangered by the excavation. Contractor shall bear costs of repairing damaged utilities.

30.3 If the above-mentioned utilities or lines occur in the earth within the construction site, the Contractor shall first probe and make every effort to locate the lines prior to excavating in the respective area.

30.4 Cutting into existing utilities and services shall be done in coordination with and as designated by the Owner of the utility. The Contractor shall work continuously to restore service(s) upon deliberate or accidental interruption, providing premium time and materials as needed without extra claim to the Owner.

30.5 The Contractor shall repair to the satisfaction of the Engineer any surface or subsurface improvements damaged during the course of the work unless such improvement is shown to be abandoned or removed.

30.6 Machine excavation shall not be permitted within ten feet of existing gas or fuel lines. Hand excavate only in these areas, in accord with utility company, agency or other applicable laws, standards or regulations.

30.7 Protect all new or existing lines from damage by traffic, etc. during construction.

30.8 Protect existing trees, indicated to remain with fencing or other approved method. Hold all new subsurface lines outside the drip line of trees, offsetting as necessary to protect root structures. Refer to planting or landscaping plans, or in their absence, consult with the Architect.

PART 31 - MANUFACTURER'S NAMEPLATE

31.1 Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

PART 32 - ELECTRICAL CONNECTIONS

32.1 The Contractor shall furnish and install all power wiring complete from power source to motor or equipment junction box, including power wiring through starters. The Contractor shall install all starters not factory mounted on equipment. Unless otherwise noted, the supplier of equipment shall furnish starters with the equipment. Also, refer to Division 20, 22, 23, 25, 27, and 28 of Specifications, shop drawings and equipment schedules for additional information and requirements.

32.2 All control, interlock, sensor, thermocouple, and other wiring required for equipment operation shall be provided by the Contractor. All such installations shall be fully compliant with all requirements of Division 26 regardless of which trade actually installs such wiring. Motors and equipment shall be provided for current and voltage characteristics as indicated or required. All wiring shall be enclosed in raceways unless otherwise noted.

32.3 Each Contractor or Sub-Contractor, prior to bidding the work, shall coordinate power, control, sensor, interlock and all other wiring requirements for equipment or motors with all other

contractors or sub-contractors, to ensure all needed wiring is provided in the Contract. Failure to make such coordination shall not be justification for claims of extra cost or a time extension to the Contract.

PART 33 - FINAL CONNECTIONS TO EQUIPMENT

33.1 The roughing-in and final connections to all electrically operated equipment furnished under this and all other sections of the contract documents or by others, shall be included in the Contract and shall consist of furnishing all labor and materials for connection. The Contractor shall carefully coordinate with equipment suppliers, manufacturer's representatives, the vendor, or other trades to provide complete electrical and dimensional interface to all such equipment (kitchen, hoods, mechanical equipment, panels, refrigeration equipment, etc.).

PART 34 - ENERGIZED EQUIPMENT

34.1 At no time shall the contractor work on energized electrical equipment. Contractor shall comply with NFPA 70E requirements at all times throughout construction.

PART 35 - MOTORS

35.1 Each motor shall be provided by the equipment supplier, installer or manufacturer with conduit terminal box and NEC required disconnecting means as indicated or required. Three-phase motors shall be provided with external thermal overload protection in their starter units. Single-phase motors shall be provided with thermal overload protection, integral to their windings or external, in control unit. All motors shall be installed with NEMA-rated starters as specified and shall be connected per the National Electrical Code.

35.2 The capacity of each motor shall be sufficient to operate associated driven devices under all conditions of operation and load and without overload, and at least of the horsepower indicated or specified. Each motor shall be selected for quiet operation, maximum efficiency and lowest starting KVA per horsepower as applicable. Motors producing excessive noise or vibration shall be replaced by the responsible contractor. Refer to Division 20, 22, 23, 24 and 25 of the Specifications for further requirements and scheduled sizes.

35.3 All three-phase motors shall be tested for proper rotation. Correct wiring if needed and retest. Document testing and corrective action in operations and maintenance manual.

PART 36 - CUTTING AND PATCHING

36.1 Unless otherwise indicated or specified, the Contractor shall provide cutting and patching necessary to install the work specified in this Division. Patching shall match adjacent surfaces to the satisfaction of the Engineer and shall be in accord with the Architect's standards for such work, as applicable.

36.2 No structural members shall be cut without the approval of the Structural Engineer and all such cutting shall be done in a manner directed by him.

36.3 When installing conduit, pipe, or any other work in insulated concrete form (ICF) walls, the responsible subcontractor for the work shall provide spray foam insulation to patch the rigid insulation to maintain full integrity of the insulating value of the wall after the mechanical and electrical work is complete. Furthermore, all new work shall NOT be installed in concrete center of wall. All mechanical and electrical installations shall be on the interior side of the concrete.

PART 37 - SLEEVES AND PLATES

37.1 Each Contractor shall provide and locate all sleeves and inserts required for his work before the floors and walls are built or shall be responsible for the cost of cutting and patching required

where sleeves and inserts were not installed, or where incorrectly located. Each Contractor shall do all drilling required for the installation of his hangers. Drilling of anchor holes may be prohibited in post-tensioned concrete construction, in which case the Contractor shall request approved methods from the Architect and shall carefully coordinate setting of inserts, etc., with the Structural Engineer and/or Architect.

37.2 Sleeves shall be provided for all electrical conduit passing thru concrete floor slabs and concrete, masonry, tile, and gypsum wall construction. Sleeves shall not be provided for piping running embedded in concrete or insulating concrete slabs on grade, unless otherwise noted.

37.3 Where sleeves are placed in exterior walls below grade, the space between the pipe or conduit and the sleeves shall be packed with oakum and lead, mechanical waterstop or other approved material and made completely watertight by a method approved by the Engineer and/or Architect.

37.4 Where conduit motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Check floor and wall construction finishes to determine proper length of sleeves for various locations; make actual lengths to suit the following:

A. Terminate sleeves flush with walls, partitions, and ceiling.

B. In areas where pipes are concealed, as in chases, terminate sleeves flush with floor.

C. In all areas where pipes are exposed, extend sleeves 1/2 inch above finished floor, except in rooms having floor drains, where sleeves shall be extended 3/4 inches above floor.

37.5 Sleeves shall be constructed of 24-gauge galvanized sheet steel with lock seam joints for all sleeves set in concrete floor slabs terminating flush with the floor. All other sleeves shall be constructed of galvanized steel pipe unless otherwise indicated on the drawings.

37.6 Fasten sleeves securely in floors, walls, so that they will not become displaced when concrete is poured or when other construction occurs around them. Take precautions to prevent concrete, plaster or other materials being forced into the space between pipe and sleeve during construction. Fire and smoke stop all sleeves in a manner approved by the local authority having jurisdiction or per prevailing codes.

PART 38 - ANCHORS

38.1 Each Contractor shall provide and locate all inserts required for his work before the floors and walls are built or shall be responsible for the cost of cutting and patching required where inserts were not installed, or where incorrectly located. Each Contractor shall do all drilling required for the installation of his hangers. Drilling of anchor holes may be prohibited in post-tensioned concrete construction, in which case the Contractor shall request approved methods from the Architect and shall carefully coordinate setting of inserts, etc., with the Structural Engineer and/or Architect.

PART 39 - CONDUIT MOUNTING HEIGHTS

39.1 All exposed or concealed conduit, raceways, etc., shall be held as high as possible unless otherwise noted and coordinated with all other trades. Exposed conduit shall, insofar as possible, run perpendicular or parallel to the building structure.

PART 40 - PAINTING

40.1 Each fixture device, panel, junction box, etc., that is located in a finished area shall be provided with finish of color and type as selected or approved by the Architect or Engineer. If custom color is required, it shall be provided at no additional cost to the Owner. All other equipment, fixtures or devices located in finished or unfinished areas, that are not required to have or are

provided with finish color or coating shall be provided in a prime painted condition, ready to receive finish paint or coating. All galvanized metal in finished areas shall be properly prepared with special processes to receive finish paint as directed and approved by the Architect.

PART 41 - WEATHERPROOFING

41.1 Where any work pierces waterproofing, including waterproof concrete, the method of installation shall be as approved by the Architect and/or Engineer before work is done. The Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

41.2 Wherever work penetrates roofing, it shall be done in a manner that will not diminish or void the roofing guarantee or warranty in any way. Coordinate all such work with the roofing installer.

PART 42 - EQUIPMENT/CONTROLS STARTUP & VERIFICATION

42.1 A pre-start-up conference shall be held with the Engineer, Owner, Construction Manager, Mechanical Contractor, Electrical Contractor, Controls Contractor, Test and Balance Contractor, and any manufacturer's providing startup services. The purpose of this meeting will be to discuss the goals, procedures, etc. for start-up

42.2 Equipment and controls startup and verification shall be required for this project. A specific line-item shall be included on the schedule of values by each Trade for "equipment and controls startup". This line-item value shall be approved by the Engineer. The Engineer, Owner and the Engineer's Field Inspectors shall closely monitor progress and quality of the equipment and controls startup and may withhold pay requests as deemed appropriate.

42.3 The Contractor shall include in the bid to provide equipment and controls startup and verification for ALL Electrical systems specified for this project. Specific startup/verification specifications are included throughout the Electrical specifications. In general, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians (not third-party contractors) and shall complete and submit start-up reports/checklists. Submit factory start-up reports to the Engineer. The contractor shall have appropriate trades on site to correct all deficiencies noted by the factory representative. For each deficiency noted, documentation of corrective action (including date and time) shall be submitted to the Engineer and Owner.

42.4 Many pieces of equipment and systems are specified with "manufacturer" startup. In general, the manufacturer's recommended startup procedures and checklists will be acceptable for use in the project. Where "manufacturer" startup is not specified, then this Contractor shall perform startup services in strict accordance with manufacturer's instructions. All startup/verification process shall be thoroughly documented by the Contractor and shall include the time and date when performed.

42.5 The Contractor shall be responsible for completion of their own System Verification Checklist (SVC) / Manufacturer's Checklists. Furnish to the Testing Agent and Engineer. Sample checklists shall be submitted to the Engineer, Owner, and Testing Agent for approval.

PART 43 - OPERATING INSTRUCTIONS

43.1 Upon completion of all work and all tests, each Contractor shall furnish the necessary skilled labor and helpers for operating his systems and equipment for a period of three days of eight hours each, or as otherwise specified. During this period, instruct the Owner or his representative fully in the operations, adjustment, and maintenance of all equipment furnished. Give at least one week's written notice to the Owner, Architect and Engineer in advance of this period. The Engineer may attend any such training sessions or operational demonstrations. The Contractor shall certify in writing to the Engineer that such demonstrations have taken place, noting the date, time and names of the Owner's representative that were present.

43.2 Unless specified otherwise in Division 1, each Contractor shall furnish three (3) complete bound sets for approval to the Engineer of typewritten and/or blueprinted instructions for operating and maintaining all systems and equipment included in this contract. All instructions shall be submitted in draft, for approval, prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions.

43.3 Unless specified otherwise in Division 1, each Contractor, in the above-mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this contract and a detailed, easy to read parts list and the name and address of the nearest source of supply.

PART 44 - CLEANING

44.1 The Contractor shall, at all times, keep the area of his work presentable to the public and clean of rubbish caused by his operations; and at the completion of the work, shall remove all rubbish, all of his tools, equipment, temporary work, and surplus materials, from and about the premises, and shall leave the work clean and ready for use. If the Contractor does not attend to such cleaning immediately upon request, the Engineer may cause cleaning to be done by others and charge the cost of same to the responsible Contractor. Each Contractor shall be responsible for all damage from fire which originates in, or is propagated by, accumulations of his rubbish or debris.

44.2 After completion of all work and before final acceptance of the work, each Contractor shall thoroughly clean all equipment and materials and shall remove all foreign matter such as grease, dirt, plaster, labels, stickers, etc., from the exterior of materials, equipment, and all associated fabrication. Pay particular attention to finished area surfaces such as lighting fixture lenses, lamps, reflectors, panels, etc.

PART 45 - INDEMNIFICATION

45.1 The Contractor shall hold harmless and indemnify the Engineer, employees, officers, agents and consultants from all claims, loss, damage, actions, causes of actions, expense and/or liability resulting from, brought for, or on account of any personal injury or property damage received or sustained by any person, persons, (including third parties), or any property growing out of, occurring, or attributable to any work performed under or related to this contract, resulting in whole or in part from the negligence of the Contractor, any subcontractor, any employee, agent or representative.

PART 46 - HAZARDOUS MATERIALS

46.1 The Contractor is hereby advised that it is possible that asbestos and/or other hazardous materials are or were present in this building(s). Any worker, occupant, visitor, inspector, etc., who encounters any material of whose content they are not certain shall promptly report the existence and location of that material to the Contractor and/or Owner. The Contractor shall, as a part of his work, ensure that his workers are aware of this potential and what they are to do in the event of suspicion. He shall also keep uninformed persons from the premises during construction. Furthermore, the Contractor shall insure that no one comes near to or in contact with any such material or fumes therefrom until its content can be ascertained to be non-hazardous.

46.2 Any worker, occupant, visitor, inspector, etc., who encounters any material of whose content they are not certain shall promptly report the existence and location of that material to the Contractor and/or Owner. The Contractor shall, as a part of their work, ensure that their workers are aware of this potential and what they are to do in the event of suspicion. The Contractor shall also keep uninformed persons from the premises during construction. Furthermore, the Contractor shall insure that no one comes near to or in contact with any such material or fumes therefrom until its content can be ascertained to be non-hazardous.

46.3 CMTA, Inc., Consulting Engineers, have no expertise in the determination of the presence of hazardous materials. Therefore, no attempt has been made by them to identify the existence or location of any such material. Furthermore, CMTA nor any affiliate thereof will neither offer nor make any recommendations relative to the removal, handling, or disposal of such material.

46.4 If the work interfaces, connects or relates in any way with or to existing components which contain or bear any hazardous material, asbestos being one, then, it shall be the Contractor's sole responsibility to contact the Owner and so advise him immediately.

46.5 The Contractor by execution of the contract for any work and/or by the accomplishment of any work thereby agrees to bring no claim relative to hazardous materials for negligence, breach of contract, indemnity, or any other such item against CMTA, its principals, employees, agents, or consultants. Also, the Contractor further agrees to defend, indemnify, and hold CMTA, its principals, employees, agents, and consultants, harmless from any such related claims which may be brought by any subcontractors, suppliers or any other third parties.

PART 47 - ABOVE CEILING AND FINAL PUNCH LISTS

47.1 The Contractor shall review each area and prepare a punch list for each of the subcontractors, as applicable, for at least two stages of the project.

A. For review of in-wall work that will be concealed by drywall or other materials well before substantial completion.

B. For review of the above-ceiling work that will be concealed by tile or other materials well before substantial completion.

C. For review of all other work as the project nears substantial completion.

47.2 When all work from the Contractor’s punch list is complete at each of these stages and prior to completing ceiling installations (or at the final punch list stage), the Contractor shall request that the Engineer develop a punch list. This request is to be made in writing two weeks prior to the proposed date. After all corrections have been made from the Engineer’s punch list, the Contractor shall review and initial off on each item. This signed-off punch list and all work prior to the ceilings being installed and at the final punch list review.

47.3 After all corrections have been made from the Engineer's punch list, the Contractor shall review and initial off on each item. This signed-off punch list shall be submitted to the Engineer. The Engineer shall return to the site once to review each punch list and all work prior to the ceilings being installed and at the final punch list review.

47.4 At the engineer’s option, the contractor shall supply digital photographs via email or file-share of any installed work.

47.5 If additional visits are required by the Engineer to review work not completed by this review, the Engineer shall be reimbursed directly by the Contractor by check or money order (due next 10 days from date of each additional visit) at a rate of $150.00 per hour for extra trips required to complete either of the above-ceiling or final punch lists.

47.6 All panelboard fronts shall be omitted until final punch list inspection is made. Directories for each panelboard shall be completed and available for review by the Engineer at that time.

PART 48 - POSTED OPERATING INSTRUCTIONS

48.1 Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:

A. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

B. Start up, proper adjustment, operating, lubrication, and shutdown procedures.

C. Safety precautions.

D. The procedure in the event of equipment failure.

E. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

48.2 Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

PART 49 - TRAINING AND RELATED SUBMITTALS

49.1 Upon completion of all work and all tests, Contractor shall provide classroom and in the field training for each type and/or model of equipment installed. Training shall be led by qualified factory certified technician. Contractor shall submit a request to schedule training sessions a minimum of two weeks in advance. Submission shall include qualifications of instructor as well as a syllabus that the Owner will add/deduct to as they see fit. Each individual listed as an “Attendee” on the roster submitted by the Owner shall receive a copy of the maintenance manual to review during training. All training sessions shall be recorded and a DVD with proper labels identifying the date, equipment, and project shall be delivered prior to Completion of the project. If the audio from the recording is unclear, narration shall be added. The Contractor shall certify in writing to the Engineer that such demonstrations have taken place, noting the date, time and names of the Owner's representative that were present.

49.2 The training phase shall be accompanied by complete as-built documentation and the technical systems operation manual.

49.3 These training sessions shall be videotaped by the Installer and copies provided to the Owner within one (1) week of training

49.4 Brochures: Furnish Owner a complete set of operating instructions and diagrams.

49.5 Systems/Components which require owner training. The training shall be accomplished by a factory trained representative. Include (8) hours minimum for each system described here-in. Each equipment representative shall be represented wherever their equipment is used. All training shall be videotaped by the Installer. The following systems shall include owner training at a minimum:

A. Lighting control system

B. Electrical Distribution (Switchgear)

C. Service Grounding

D. Electrical Devices

E. Fire Alarm Materials & Labor

F. Access Controls

G. Each Low Voltage System (See System Responsibilities Matrix and SCOPE OF THE ELECTRICAL WORK)

49.6 Instruction Program: Submit outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

49.7 At completion of training, submit two complete training manual(s) for Owner's use.

49.8 Qualification Data: For facilitator, instructor, and photographer.

49.9 Attendance Record: For each training module, submit list of participants and length of instruction time.

49.10 Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

49.11 Demonstration and Training DVDs: Submit two copies within seven days of end of each training module.

49.12 Identification: On each copy, provide an applied label with the following information:

A. Name of Project.

B. Name and address of photographer.

C. Name of Architect and Construction Manager.

D. Name of Contractor.

E. Date video was recorded.

F. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

49.13 Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video. Include name of Project and date of video on each page.

PART 50 - EQUIPMENT/SYSTEMS TESTING, VERIFICATION, & START-UP

50.1 The Contractor (and Sub-Contractors) shall be responsible for commissioning, starting-up, testing, checking, examining, inspecting, etc. their own systems.

50.2 The Electrical Contractor shall designate an individual under his employment to lead the startup, testing and verification process. This person should not be the project manager or job site superintendent, but a person dedicated to making this critical task successful and completed in a timely manner.

50.3 This individual shall also be responsible for the following items:

A. All identification and labeling requirements per plans and specifications.

B. Submission of switchgear coordination study, fault current study, and arc flash hazard analysis.

50.4 A pre-start-up conference shall be held with the Architect, Owner, Construction Manager, Electrical Contractor, and the Manufacturers providing startup services. The purpose of this meeting will be to discuss the goals, procedures, etc. for start-up.

50.5 A specific line-item shall be included on the schedule of values for testing and verification of all systems indicated in this section. This line-item value shall be approved by the Engineer. The Engineer, Owner and the Engineer's Field Inspector(s) shall closely monitor progress and quality of the testing, verification, and startup and may withhold pay requests as deemed appropriate.

50.6 The Contractor shall test all wiring and connections for continuity and grounds before equipment and fixtures are connected, and when indicated or required, demonstrate by Megger Test the insulation resistance of any circuit or group of circuits. Where such tests indicate the possibility of faulty insulation, locate the point of such fault, pull out the defective conductor, replacing same with new and demonstrate by further test the elimination of such defect.

50.7 Systems Requiring Testing & Verification:

A. Fire Alarm System

B. Electrical Distribution Equipment

C. Lighting and Lighting Controls

D. Emergency Standby Systems

E. All Low Voltage Systems

F. Generator and Automatic Transfer Switches

G. Grounding Systems

H. Wiring and Terminations

50.8 The Contractor shall include in the bid to provide systems startup and verification for ALL electrical systems specified for this project. Specific startup, testing, and verification specifications are included throughout the Electrical specifications. In general, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians (not third party Contractors) and shall complete and submit start-up reports/checklists. Submit start-up reports to the Engineer. The Contractor shall have appropriate trades on site to correct all deficiencies noted by the factory representative. For each deficiency noted, documentation of corrective action (including date and time) shall be submitted to the Engineer and Owner. Where factory start-up is not specified for a particular piece of equipment or system, the Contractor shall be responsible to perform start-up.

50.9 The Contractor shall be responsible for completion of System Verification Checklist (SVC) / Manufacturer's Checklists. Furnish to the Testing Agent and Engineer. Sample checklists shall be submitted to the Engineer, Owner, and Testing Agent for approval.

50.10 The completed reports shall be organized and bound together in a tabbed binder and submitted for review and approval.

PART 51 - SPECIAL WRENCHES, TOOLS, AND KEYS

51.1 Each Contractor shall provide, along with the equipment provided, any special wrenches or tools necessary to dismantle or service equipment or appliances installed by him. Wrenches shall include necessary keys, handles and operators for valves, switches, breakers, etc. and keys to electrical panels, alarm pull boxes and panels, etc. At least two (2) of any such special wrench, keys, etc. shall be turned over to the Architect prior to completion of the project. Obtain a receipt that this has been accomplished and forward a copy to the Engineer.

PART 52 - CLOSEOUT DOCUMENTS

52.1 All items listed in this section shall be provided to the engineer upon substantial completion. Provide three bound copies with complete index and tabs to locate each item.

52.2 As-Built Record Drawings:

A. The Contractor shall insure that any deviations from the design are being recorded daily, as necessary, on record drawings being maintained by the Contractor. Dimensions from fixed, visible permanent lines or landmarks shown in vertical and horizontal ways shall be utilized. Compliance shall be a requirement for final payment. Pay particular attention to the location of underfloor or underground exterior in-contract or utility-owned or leased service lines, main switches, and other appurtenances important to the maintenance and safety of the Electrical System. Deliver these record drawings to the Engineer as a system is completed, within ten days of the mark-up and/or while the accuracy of the mark-ups can be verified visually. Monthly payment may be withheld if the requirement is not complied with.

B. All underground utilities/piping installed as part of this project shall be surveyed by a land surveyor licensed in Kentucky. This shall include underground electrical primary, communications, vaults. The survey shall include actual duct bank depths to top of conduit

every 100 feet in length. The survey shall also include benchmarks dimensions relative to above grade, fixed structures. The survey shall be furnished on a compact disc in AutoCad ".dwg" format and ".pdf" format. Provide a GPS coordinate of each geothermal well and indicate on the as-built drawing. The survey information shall be included in the closeout documentation.

C. Refer to additional record drawing requirements within the general conditions and other sections of these specifications.

52.3 Start-up and System Testing Certifications and Reports:

A. Provide reports from all required testing to indicate procedures followed and complete results of all tests. Provide reports on manufacturer's standard forms for all equipment and system tests. Testing shall be per applicable NEC, NFPA, UL, NETA, and/or ANSI standards.

52.4 Operation and Maintenance Manuals

A. Upon substantial completion of the project, the Contractor shall deliver to the Engineers (in addition to the required Shop Drawings) three (3) complete bound hard copies and a digital copy of operation and maintenance instructions and parts lists for all equipment provided in this contract. Formatting and content shall follow the guidelines outlined in the latest version of ASHRAE Application Handbook, Guideline 4. As a minimum, the following shall be included:

B. All instructions shall be submitted in draft, for approval, prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions.

C. Each Contractor, in the above mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this contract and a detailed, easy to read parts list and the name and address of the nearest source of supply.

D. The operation and maintenance document directory should provide easy access and be well organized and clearly identified.

E. The operation and maintenance manuals shall contain the following information:

1. Emergency information should be immediately available during emergencies and should include emergency and staff and/or agency notification procedures.
2. Provide contacts (company name, address, phone number, email) where parts may be purchased for all equipment.
3. Provide detailed maintenance instructions, including recommended preventative maintenance schedules for all equipment requiring maintenance. For lighting and lighting controls, provide recommended relamping program, provide a schedule for inspecting and recalibrating lighting controls, and provide a recommended settings list for all components with adjustable settings.
4. General Information. Provide the following:
    a. Building function
    b. Building description
    c. Operating standards and logs
5. Technical Information. Provide the following:
    a. System description
    b. Operating routines and procedures
    c. Seasonal start-up and shutdown
    d. Special procedures
    e. Basic troubleshooting
6. The maintenance manual should contain the following information:
    a. Equipment data sheets. Provide the following:
        1) Operating and nameplate data
        2) Warranty

3) Detailed operating instructions.

b. Maintenance program information. Provide the following:

1) Manufacturer's installation, operation, and maintenance instructions
2) Spare parts information
3) Preventive maintenance actions
4) Schedule of actions
5) Action description
6) History

7. Test reports document observed performance during start-up and commissioning.
8. Reference Division 1 specifications for additional requirements.

52.5 Shop drawings will not be accepted as satisfying the requirement for Operation and Maintenance Manuals.

52.6 Shop Drawings: Provide complete copies of all approved shop drawings. Where shop drawings were returned "Furnish as Corrected", the contractor shall make the corrections noted by the engineer and submit final corrected shop drawings with close-out documentation.

52.7 Parts Lists: Provide an inventory of all spare parts, special tools, attic stock, etc. that have been provided to the owner.

52.8 Warranties: Contractor's one year warranty and all other specific warranties indicated in the construction documents.

52.9 Training Verification: Provide certification that all specified training has been completed. List training session dates, times, and types.

52.10 Inspection Certificates: Provide certificates of inspection from electrical inspector, fire marshal, and any other required special inspections.

52.11 Panel Schedules: Provide hard copies and digital copies of Excel files for all panel-board schedules.

52.12 Final Power System Study Reports.

52.13 Fire Alarm System Certification.

52.14 Power Riser Diagram: Provide a framed full-size copy of the overall power riser diagram (under glass) to the Owner. Also, provide three vinyl-coated copies of same. Where an existing power riser diagram is present, the Contractor shall obtain the document from the Owner, and update in digital format with the scope of this project. Edits shall be in digital format and this work shall be closely coordinated with the Owner.

52.15 Fire Alarm Riser Diagram: Provide vinyl coated fire alarm system diagrams including floor plans and device addresses at fire alarm equipment. Provide a full system diagram at the main fire alarm control panel and provide the respective level's system diagram at the NAC panels located on other levels of the structure. Where an existing power riser diagram is present, the Contractor shall obtain the document from the Owner, and update in digital format with the scope of this project. Edits shall be in digital format and this work shall be closely coordinated with the Owner.

END OF SECTION 260501

SECTION 260502 - SCOPE OF THE ELECTRICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SCOPE OF THE ELECTRICAL WORK

A. The Electrical work for this project includes all labor, materials, equipment, fixtures, excavation, backfill and related items required to completely install, test, verify place in service and deliver to the Owner complete electrical systems in accordance with the accompanying plans and all provisions of these specifications. This work shall primarily include, but is not limited to the following:

1. All raceways, conduits, cable management systems, cable trays, J-hooks, conductors, outlet boxes, fittings, pull boxes, manholes, etc.
2. All low-voltage distribution equipment, switchboards, panelboards, disconnect switches, fuses, transformers, contactors, starters, etc.
3. Electrical Studies including Fault Current, Arc Flash, and Coordination Studies. All studies to be performed by manufacturer of electrical distribution equipment.
4. Electrical Contractor shall install, mount and wire VFD’s which shall be furnished by the Mechanical Contractor, unless otherwise noted.
5. All wiring devices and device plates.
6. Cable splicing, terminations, supports, etc.
7. All light fixtures, drivers, ballasts, and lamps.
8. Emergency engine generator, automatic transfer switches and distribution.
9. Emergency Power System including all branch circuits and feeders.
10. Electrical connection to all electrically operated equipment furnished and/or installed by others, including powered casework, gym/athletic equipment, mechanical equipment, kitchen equipment, etc.
11. Grounding, per NEC and specified requirements.
12. Identification of electrical systems and equipment labeling.
13. All low-voltage systems as listed in System Responsibilities Matrix on Electrical Legend.
14. Pathways and raceways for all low-voltage systems shall be in accordance with Division 26 and 27 Specifications and provided by the Division 26 Contractor. All other Division 27/28 infrastructure shall be provided by the Division 27/28 contractor.
15. Provide pathways and raceways for all door hardware and access controls required in Section 087100 – Door Hardware specification.
16. Provide 120VAC and low-voltage wiring for all door hardware and access controls required in Section 087100 – Door Hardware specification.
17. Generator and Automatic Transfer Switches.
18. Fire alarm system in accordance with Division 28 Specifications.
19. Cabling, testing and devices for data/voice network.
20. All necessary coordination with the Owner, electric utility company, telephone company, cable television company, etc. to ensure that work, connections, etc., that they are to

provide is accomplished and that service to this facility is delivered complete prior to occupancy.

21. Paying all necessary fees and cost for inspection of Division 26, 27 and 28 electrical systems by a Licensed Electrical Inspector.
22. Paying all necessary fees and cost for permits and electrical inspections.
23. Prior to submitting a bid, the Contractor shall contact all serving utility companies and municipal services to determine exactly what each utility company will provide and exactly what is required of the Contractor and the Contractor shall include all such requirements in his base bid. This shall include relocation fees and construction cost recovery due to Power Utility Company and Cable Company or their successors.
24. All general and special conditions required to accomplish the work.
25. Special Note: A specialty sub-contractor (Electronic Systems Contractor) shall be utilized for all video, paging-intercom system, data/voice network, fire alarm work, sound systems and for the security system installation. The sub-contractor shall be especially skilled in such work and shall be able to demonstrate that their regular business involves such installations. The specialty sub-contractor(s) shall be acceptable to and approved by the Owner. The names of each such sub-contractor shall be listed on the form of proposal at the time of opening bids. Provisions for branch circuits, pulling of cabling, and installation of raceways for specialty systems may be regular sub-contractor if approved by specialty contractor. All terminations, connections, check-out, and testing shall be by specialty Contractor.

1.3 SYSTEM COMMISSIONING

A. Section 019113 requires the engagement of a Commissioning Authority to document the completion of the Mechanical, Fire Protection, Plumbing, Electrical, Electronic Safety and Security, and associated Control Systems for the project. Section 019113 defines the roles and responsibilities of each member of the commissioning team.

B. Comply with the requirements of Section 019113 for the commissioning of the various building systems.

END OF SECTION 260502

SECTION 260503 - SHOP DRAWINGS, SUBMITTALS, LITERATURE, MANUALS, PARTS LISTS, AND SPECIAL TOOLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Each Contractor shall submit to the Architect and/or Engineer, within thirty days after the date of the Contract, eight (8) sets of shop drawings and/or manufacturer’s descriptive literature on all equipment required for the fulfillment of his contract. Each shop drawing and/or manufacturer’s descriptive literature shall have proper notation indicated on it and shall be clearly referenced so the specifications, schedules, light fixture numbers, panel names and numbers, etc., so that the Architect and/or Engineer may readily determine the particular item the Contractor proposes to furnish. All data and information scheduled, noted, or specified by hand shall be noted in color red on the submittals. The Contractor shall make any corrections or changes required and shall resubmit for final review as requested. Review of such drawings, descriptive literature and/or schedules shall not relieve the Contractor from responsibility for deviation from drawings or specifications unless they have, in writing, directed the reviewer’s attention to such deviations at the time of submission of drawings, literature and manuals; nor shall it relieve them from responsibility for errors or omissions of any nature in shop drawings, literature and manuals. The term “as specified” will not be accepted.

B. If the Contractor fails to comply with the requirements set forth above, the Architect and/or Engineer shall have the option of selecting any or all items listed in the specifications or on the drawings, and the Contractor will be required to provide all materials in accordance with this list.

C. Review of shop drawings by the Engineer applies only to conformance with the design concept of the project and general compliance with the information given in the contract documents. In all cases, the installing Contractor alone shall be responsible for furnishing the proper quantity of equipment and/or materials required, for seeing that all equipment fits the available space in a satisfactory manner and that piping, electrical and all other connections are suitably located.

D. The Engineer's review of shop drawings, schedules or other required submittal data shall not relieve the Contractor from responsibility for the adaptability of the equipment or materials to the project, compliance with applicable codes, rules, regulations, information that pertains to fabrication and installation, dimensions and quantities, electrical characteristics, and coordination of the work with all other trades involved in this project.

E. No cutting, fitting, rough-in, connections, etc., shall be accomplished until reviewed equipment shop drawings are in the hands of the Contractors concerned. It shall be each Contractor's responsibility to obtain reviewed shop drawings and to make all connections, etc. in the neatest and most workmanlike manner possible. Each Contractor shall coordinate with all the other Contractors having any connections, roughing-in, etc., to the equipment, to make certain proper fit, space coordination, voltage and phase relationships are accomplished.

F. Shop Drawings: Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and

other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

G. Product Data: Submittal shall include performance and characteristic curves.

1.3 SUBMITTALS AND SHOP DRAWING

A. In accord with the provisions specified hereinbefore, shop drawings, descriptive literature and schedules shall be submitted on each of the following indicated items as well as any equipment or systems deemed necessary by the Engineer:

1. Power Equipment

   a. Fault Current, Arc Flash and Coordination studies (submit along with switchgear & panelboards).
   b. Switchboards, distribution panelboards and panelboards.
   c. Circuit breakers or fusible switches, per each type.
   d. Dry-type transformers.
   e. Power and lighting contactors.
   f. Disconnect switches.
   g. Fuses, per each type required.
   h. Magnetic starters, if not submitted with unit equipment by supplier.
   i. Control components (relays, timers, selector switches, pilots, etc.)
   j. Motor starters, if not submitted with unit equipment by supplier.
   k. Building service grounding electrode components.
   l. Metering devices.
   m. Emergency generator, engine fuel system and transfer switches, with all required generator system accessories, such as battery charger, batteries, exhaust system and its insulation, fuel pumps, etc.
   n. Transient voltage surge suppression devices (SPD).

2. Raceways

   a. Conduits and each type of conduit fittings.
   b. Cable/ladder tray and each type of cable tray fitting.
   c. Surface-mounted metal or plastic raceways, with each type of fitting.
   d. Wireways and each type of wireway fitting.
   e. J-hook assembly.
   f. Composite pull boxes.

3. Conductors

   a. Conductors, splicing devices, and connectors, each by type.
   b. Splice or tap blocks.

4. Devices

   a. Each type of wiring device and their cover plates.
   b. Floor boxes and poke-thrus, each by type, with required accessories.
   c. Any special items not listed above.

5. Lighting

   a. Light fixtures, each by type, marked to indicate all required accessories and lamp selection. Also provide original color selection chart to allow Architect and/or Engineer to indicate color selection.
   b. Lamps, each by type.
   c. Ballast and drivers, each by type.
   d. Lighting standards or poles.
   e. Photocells, time clocks or other lighting accessories.

f. Lighting control system schematic, functional & programming data, along with building specific floor plan drawings indicating each device, master controller, input device locations and specific interconnect/wiring requirements for each device.

6. Fire alarm system.

   a. Each system submittal is to be complete with legible cutsheets for all devices, equipment, special wiring, etc. Include system specific wiring schematics showing each device and its specific interconnect/wiring requirements. For rack mounted equipment, provide a scalable elevation drawing with proposed component locations & specific interconnect wiring requirements for each component/panel. Also, provide scale building specific layout drawings that indicate device placement, wiring, etc. Refer to the specific system's specification 283100 for additional submittal requirements where required.

7. Complete Grounding System

   a. Electrodes, bonding devices, terminals, etc.
   b. Building service grounding electrode components.

8. Miscellaneous

   a. Control panel assemblies.
   b. Non-standard junction/pull boxes.
   c. Manholes, hand holes, and all outdoor electrical equipment and fittings.
   d. Floor plan and riser drawings that show the location of all fire alarm devices.
   e. Floor plan and riser drawings that show the location of all low-voltage systems.
   f. Fire-stopping materials including wrap, caulk, putty, sleeves, etc.
   g. Seismic Restraints
   h. Dimensioned electrical room plans/equipment layouts

9. Systems

   a. Note: Each system submittal is to be complete with legible cutsheets for all devices, equipment, special wiring, etc. Also provide scale building layout drawings that indicate device placement, wiring, etc. Drawings shall be in digital format and shall include complete (not typical) riser diagrams of all systems. Refer to specific system's specification for additional submittal requirements where required.
   b. Fire alarm system
   c. Building paging/intercom audio system
   d. Telephone system
   e. Television/video system
   f. Data network
   g. Wireless intercom system
   h. Security systems(s)
   i. All other systems as listed on Systems Responsibility Matrix - See Electrical Legend.

10. Special wrenches, tools and keys

1.4 FIRE ALARM SHOP DRAWINGS

A. The Contractor and equipment supplier shall submit to the Architect and/or Engineer, fire alarm system shop drawings complete with catalog cuts, descriptive literature, and complete system wiring diagrams for their review prior to the Contractor’s submittal to the Department of Housing, Buildings and Construction or other governing authority for their review. No work shall be done until drawings are approved by the Department of Housing, Buildings and Construction.

B. Fire alarm drawings shall be created in digital format (CAD or equivalent). Drawings shall include all power supply, battery, and circuit load and voltage drop calculations as required by NFPA. Complete wiring diagrams and proposed device addresses shall be provided.

C. Shop drawings shall indicate all devices as required to satisfy all local and state mandates, whether indicated on construction drawings or not. Include all components as required for a complete and operational system.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION 260503

SECTION 260504 - SLEEVING, CUTTING, PATCHING AND REPAIRING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 SUMMARY

A. The Contractor shall be responsible for all openings, sleeves, trenches, etc. that he may require in floors, roofs, ceilings, walls, etc. and shall coordinate all such work with the Construction Manager, General Contractor, and all other trades. He shall determine and coordinate any openings which he is to provide before submitting a bid proposal in order to avoid conflict and disagreement during construction. Improperly located openings shall be reworked at the expense of the responsible Contractor.

B. The Contractor shall plan his work ahead and shall place sleeves, frames or forms through all walls, floors and ceilings during the initial construction, where it is necessary for conduit, conductors, wireways, etc. to go through; however, when this is not done, this Contractor shall do all cutting and patching required for the installation of his work, or he shall pay other trades for doing this work when so directed by the Architect. Any damage caused to the buildings by the workmen of the responsible Contractor must be corrected or rectified by him at his own expense.

C. The Contractor shall cut holes in casework, equipment panels, etc. (if any), as required to pass pipes in and out.

D. The Contractor shall notify other trades in due time where he will require openings of chases in new concrete or masonry. He shall set all concrete inserts and sleeves for his work. Failing to do this, he shall cut openings for his work and patch same as required at his own expense.

E. Openings in slabs and walls shall be cut with core drill. Hammer devices will not be permitted. Edges of trenches and large openings shall be scribe cut with a masonry saw.

F. Where any cutting, coring, etc. of reinforced concrete is required, such structures shall be x-rayed to avoid damaging existing reinforcing steel.

G. Cast iron sleeves shall be installed through all walls where conduits enters the building below grade. Sleeves shall be flush with each face of the wall and shall be sufficiently larger than the entering conduit to permit thorough caulking with lead and oakum between conduit and sleeve for waterproofing.

H. In all cases, sleeves shall be at least two pipe sizes larger than nominal pipe diameter.

I. All roof penetrations shall be made inside mechanical equipment curbs, UON.

J. Sleeves passing through roof or exterior wall or where there is a possibility of water leakage and damage shall be caulked watertight for horizontal sleeves and flashed and counter-flashed with

lead (4 lb.) or copper and soldered to the piping, lapped over sleeve and properly weather sealed.

K. All rectangular or special shaped openings in plaster, stucco or similar materials including gypsum board shall be framed by means of plaster frames, casing beads, wood or metal angle members as required. The intent of this requirements is to provide smooth even termination of wall, floor, and ceiling finishes as well as to provide a fastening means for lighting fixtures, panels, etc. Lintels shall be provided where indicated over all openings in bearing walls, etc.

L. No cutting is to be done at points or in a manner that will weaken the structure and unnecessary cutting must be avoided. If in doubt, contact the Architect and Structural Engineer.

M. The Contractor shall be responsible for properly shoring, bracing, supporting, etc. any existing and/or new construction to guard against cracking, settling, collapsing, displacing, or weakening while openings are being made. Any damage occurring to the existing and/or new structures, due to failure to exercise proper precautions or due to action of the elements, shall be promptly and properly made good to the satisfaction of the Architect.

N. All work improperly done or not done at all as required by the Electrical trades in this section will be performed by the Contractor at the direction of the trade whose work is affected. The cost of this work shall be paid for by the Contractor who is in non-compliance with the Contract.

O. All penetrations shall be patched with materials matching that which has been disturbed.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, hot-dipped galvanized, plain ends.

B. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness: 0.138 inch (10 gauge)

2.2 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. The Contractor shall provide and locate all sleeves and inserts required for his work before the floors and surface being penetrated are built, otherwise the Contractor shall core drill for conduits where sleeves and inserts were not installed, or where incorrectly located. Core drilling is the only acceptable alternative to sleeves. Do not chisel openings. Where sleeves are placed in exterior walls or in slabs on grade, the space between the conduit and the sleeves shall be made completely and permanently watertight.

D. Conduits that penetrate fire and/or smoke rated assemblies shall have sleeves installed as required by the manufacturer of the rating seal used.

E. Fasten sleeves securely in floors, walls, so that they will not become displaced when concrete is poured or when other construction is built around them. Take precautions to prevent concrete, plaster or other materials being forced into the space between pipe and sleeve during construction.

F. Sleeves in floors shall extend 3" above finished floor level.

G. Escutcheon plates shall be provided for all conduits passing thru walls, floors, and ceilings. Plates shall be nickel plated, of the split ring type, of size to match the conduit. Where plates are provided for conduits passing thru sleeves which extend above the floor surface, provide deep recessed plates to conceal the conduit sleeves.

H. In all areas where busducts are exposed and pass thru floors, the opening shall be surrounded by a 4-inch-high by 3-inch-wide concrete curb.

I. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

3.2 CUTTING

A. No cutting is to be done at points or in a manner that will weaken the structure and unnecessary cutting must be avoided. If in doubt, contact the Engineer.

B. Conduit openings in slabs and walls shall be cut with core drill. Hammer devices will not be permitted. Edges of trenches and large openings shall be scribe cut with a masonry saw.

C. X-ray concrete slabs and walls prior to core drilling. Do not core drill through rebar, steel or reinforcing material without written permission from the Structural Engineer and Architect.

D. Openings in metal building walls shall be made in strict accord with building suppliers' recommendations.

3.3 PATCHING AND REPAIRING

A. Patching and repairing made necessary by work performed under this division shall be included as a part of the work and shall be done by skilled mechanics of the trade or trades for work cut or damaged, in strict accordance with the provisions herein before specified for work of like type to match adjacent surfaces and in a manner acceptable to the Engineer.

B. Where portions of existing lawns, shrubs, paving, etc. are disturbed for installation of work of this Division, such items shall be repaired and/or replaced to the satisfaction of the Engineer.

C. Where the installation of conduit, raceways, etc. requires the penetration of fire or smoke rated walls, ceilings or floors, the space around such conduit, raceways, etc., shall be tightly filled with an approved non-combustible fire insulating material satisfactory to maintain the rating integrity of the wall, floor or ceilings affected.

D. Conduits passing through floors, ceilings, and walls in finished areas, unless otherwise specified, shall be fitted with chrome plated brass escutcheons of sufficient outside diameter to amply cover the sleeved openings and an inside diameter to closely fit the conduit around which it is installed.

E. Stainless steel collars shall be provided around all conduits, raceways, etc., at all wall penetrations; both sides where exposed.

F. Where conduits pass through interior or exterior walls, the wall openings shall be sealed airtight. This shall include sealing on both sides of the wall to ensure air does not enter or exit the wall cavity. This is especially critical on exterior walls where the wall cavity may be vented to the exterior.

END OF SECTION 260504

SECTION 260505 – EXCAVATION, TRENCHING, BACKFILLING AND GRADING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Each Contractor shall include all excavating, filling, grading and related items required to complete his work as shown on the drawings and specified herein.

B. Electrical distribution lines and underground telephone or TV cables shall, in no case, be placed in the same trench with sanitary, storm, domestic or fire protection water lines. Telephone or cable TV services shall, in all cases, be placed in a separate trench with minimum two feet separation from electrical power lines.

C. Depths of bury shall be:

1. 48" minimum to top of primary ducts, unless otherwise noted.
2. 42" minimum to top of secondary ducts, unless otherwise noted.
3. 36" minimum to top of branch exterior circuits, unless otherwise noted.
4. 36” minimum to top of fiber/telephone/communication/misc. ducts, unless otherwise noted.

1.3 SUBSURFACE DATA

A. Subsurface investigations have been made and the results shown on the drawings. The information was obtained primarily for use in preparing foundation design. Each Contractor may draw his own conclusions therefrom. No responsibility is assumed by the Owner for subsoil quality or conditions other than at the locations and at the time investigations were made.

B. Materials to be excavated shall be unclassified, and shall include earth, rock, or any other material encountered in the excavation to the depth and extent indicated on the drawings and specified herein. No adjustment in the Contract sum will be made on account of the presence or absence of rock, shale, or other materials encountered in the excavating.

1.4 BENCH MARKS AND MONUMENTS

A. Maintain carefully all bench marks, monuments and other referenced points. If disturbed or destroyed, replace as directed.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 EXCAVATION

A. Each Contractor shall accept the site as he finds it and remove all trash, rubbish and material from the site prior to starting excavation for his work.

B. Excavate trenches to sufficient width and depth for proper installation of the work and where required, smooth the bottom on the trench with hand tools in strict accordance with OSHA Guidelines.

C. The removal of rock shall be accomplished by use of hand or power tools only. Blasting shall not be permitted unless authorized in writing by the Architect. Any damage to existing structures, exterior services or rock intended for bearing, shall be corrected at the responsible Contractor's expense.

D. Keep trenches free from water while construction therein is in progress. Under no circumstances lay conduit or cable in water. Pumping or bailing water from this Contractor's trenches, which is required during construction shall be accomplished at his expense.

E. In no case shall excavation work be accomplished that will damage in any way the new structure, existing structures, equipment, etc. Each Contractor shall take the necessary steps to prevent flow of eroded earth by water or landslide onto the property of others, or against the structures. The repair of all such damage, or any other damage incurred in the course of excavation, shall be borne by the responsible Contractor. Restore all disturbed areas to original condition.

3.2 BACKFILL

A. Concrete for concrete encasement shall cure a minimum of 3 days prior to backfill.

B. Backfill shall be accomplished with clean debris free earth and the backfill compacted to 95% standard Proctor in 6” lifts so as to avoid earth sinks along the trench. The responsible Contractor will be required to return to the project and fill any sunken areas along the route of his work.

C. Backfill trenches only after conduit and cable have been inspected by Agencies, Engineer and Owner, tested, and locations of pipe lines have been recorded on record drawings. Provide at least one week's written or fax notification to all parties of impending work that needs to be reviewed.

D. The backfill below paved areas shall be sand and brought to proper grade in 6” lifts compacted to 98% standard Proctor to receive the sub-base and paving. No paving shall be placed on uncompacted fill.

E. The backfill below sodded or seeded areas shall be brought to within six inches of finished grade. The remaining six inches shall be backfilled with clean soil.

END OF SECTION 260505

SECTION 260506 - SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 Specification Sections, and Section 260501 “General Requirements for Electrical Systems” apply to this Section.

1.2 SUMMARY

A. This section covers all demolition, restoration, and salvage required to perform the electrical work indicted on the drawings, specified and/or as required to complete the project. It is the intent of this section of work to remove all existing electrical equipment, materials, etc. which are not required for the completed building and to restore any and all finished surfaces to their original type and conditions. To accomplish these requirements, the Contractor(s) shall, at his own expense, engage the services of others already performing finish work on this project. All work shall be completed to the satisfaction of the Architect/Engineers whose decisions shall be final. This requirement shall apply to all restoration work whether indicated or specified.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and re-installed.

B. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, clean and prepare for reuse, and reinstall where indicated.

C. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to the removed, removed or salvaged, or removed and reinstalled.

D. Demolish: Completely remove and legally dispose of off-site.

E. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.

F. Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

1.4 SUBMITTALS

A. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

B. Pre-demolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective electrical demolition operations. Submit before the Work begins.

1.5 MATERIALS OWNERSHIP

A. Except for items or materials to be reused, salvaged, reinstalled or otherwise indicated to remain the Owner’s property, demolished materials shall become the Contractor’s property and shall be removed from the site with further disposition at the Contractor’s option but in compliance with ordinances and regulations related to the materials being disposed.

1.6 PROJECT CONDITIONS

A. Building will be occupied during construction. Localized areas to be demolished will be vacated during demolition work. Conduct selective electrical demolition so Owner's operations will not be disrupted.

B. Corridors immediately adjacent to the demolition areas will be occupied. Conduct demolition so that access to and between occupied areas will be maintained.

C. On-site storage or sale of removed items or materials is not permitted.

1.7 COORDINATION

A. Demolition schedule shall not interfere with Owner’s on-site operations and operations of adjacent occupied buildings.

B. Prior to beginning demolition, arrange a conference with the Construction Representative to review electrical demolition scope, procedures, schedule and items to be salvaged for the Owner.

C. Review requirements of General Demolition Contractor and work performed by other trades that rely on demolition of electrical circuitry or equipment to allow for structural demolition or removal of equipment.

D. Review areas where existing electrical circuitry and/or equipment is to remain in place and requires protection.

1.8 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notifications regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 2 - PRODUCTS

A. NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION AND RECORDING OF EXISTING CONDITIONS

A. Contractor is responsible for submitting photos and documenting existing conditions to Owner prior to commencing demolition. Systems and equipment found to be defective after demolition has commenced shall be repaired or replaced by Contractor at no additional cost to Owner.

B. Notify Construction Representative of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged. Use photographs to document conditions.

3.2 PROTECTION

A. Comply with governing laws, codes, and regulations governing fire protection and environmental protection during electrical demolition operations.

B. Existing Utilities: maintain existing utilities and building services and protect from damage during demolition operations.

1. All adjacent areas need to remain in operation and services to other areas outside area of construction need to be maintained during demolition.
2. Disconnect electrical power and communications only to the items of equipment or the panelboard that is identified for removal under the selective electrical demolition scope.
3. Provide temporary services during interruptions to existing utilities or building services as acceptable to Owner and Authorities Having Jurisdiction.

C. Protect lighting fixtures, exit signs, fire alarm devices, communications devices, etc. that are to remain in place from damage during demolition and construction operations. Exposed fixtures and devices shall have a plastic bag or other suitable covering affixed over the item to protect from dust and paint splatters.

D. Provide and maintain temporary partitions, dust control barrier, and ventilation per owner’s dust control plan.

E. Temporary enclosures and protection shall be removed by the Contractor upon completion of the electrical demolition work unless otherwise directed by the Construction Representative.

3.3 GENERAL REQUIREMENTS

A. Demolish and remove existing construction in the area of work to the extent required by new construction unless noted otherwise.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

C. Where electrical fixtures, equipment or other materials are removed and/or relocated, all abandoned conduit and conductors shall be removed in exposed areas. In concealed areas, materials shall be labeled and abandoned in place or removed as indicated and patch all openings.

D. The Contractor shall be responsible for the removal and/or relocation of any electrical equipment, fixtures, devices, appurtenances, etc. which may, in the course of construction, interfere with the installation of any new and/or relocated Architectural, Mechanical, Electrical, Structural or Fire Protection Systems whether indicated or not.

E. Where components of any system in this contractor's scope of work are to be reused, the contractor shall test those components prior to removal and record the state of functionality and condition of the components as tested. These records shall be provided to the owner or engineer upon request. In the absence of these records, all components removed shall be assumed functional at the time of removal. Any device subsequently found to be non-functioning or in unsuitable condition for reuse shall be replaced at the expense of the contractor.

F. At concealed spaces, such as hollow walls, ducts, and pipe interiors, verify condition and contents of hidden space before starting electrical demolition operations.

G. All hanger and support material for demolished piping and conduit shall be removed back to the primary structural support member. Grind connection to primary member smooth and touch up with paint to match adjacent surface.

H. Conduit containing circuits which are to be retained shall remain in place, unless otherwise indicated or required.

I. Wiring for existing circuits which must be rerouted, or which are partially abandoned, shall be reconnected to service the outlets/loads remaining on the circuit.

J. All wiring for a circuit which is to be removed or abandoned shall be removed back to the panel which supplied the circuit.

K. All open conduit knockouts, holes or unused hubs in electrical boxes and enclosures shall be properly plugged with suitable blanking devices that maintain the NEMA rating of the box or enclosure.

3.4 PATCHING AND REPAIRS

A. Unless otherwise indicated, the Contractor shall be responsible for the patching and repairing of all holes, etc. in the ceiling, wall and floors where electrical equipment is removed.

B. All damages to buildings, utilities, and services to remain in place shall be promptly repaired at no cost to the Owner.

C. Where an existing utility or building service is interrupted, the contractor shall work continuously, providing premium time, to repair and restore service.

D. Neatly cut openings and holes plumb, square and true to dimensions, required.

E. Demolish concrete and masonry in small sections, cutting at junctures with construction to remain.

F. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

G. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

H. All holes or openings in floors, walls or ceilings resulting from electrical demolition shall be properly sealed with material similar to the adjacent surface/finish.

1. Patch holes in concrete floors and ceilings where conduits are removed using non-shrink epoxy grout or concrete material to match existing surfaces and construction.
2. Patch holes in walls and partitions where conduits are removed to match existing construction and finish.

I. All rough edges of openings created by electrical demolition shall be promptly patched to create a finished surface.

J. Maintain the fire rating of all floors, walls, partitions and ceilings when patching.

3.5 SALVAGED ITEMS

A. Items noted to be salvaged shall be cleaned, packed or crated with contents identified on the container. The items shall be stored in a secure area until delivery to Owner. Transport items to storage area designated by Owner. Protect items from damage during transport and storage.

3.6 RE-INSTALLED ITEMS

A. Items noted to be removed and re-installed shall be carefully removed, cleaned, and repaired to functional condition adequate for intended reuse.

B. Pack or crate items after cleaning and repairing with contents identified on the container. Store and protect items from damage.

C. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment.

D. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

3.7 EXISTING ITEMS TO REMAIN

A. Protect construction indicated to remain against damage and soiling during selective electrical demolition.

B. When permitted by Construction Representative, items may be removed to a suitable, protected storage location during selective electrical demolition and reinstalled in their original locations after selective electrical demolition operations are complete.

3.8 DISPOSAL

A. Transport demolished materials off Owner’s property and dispose of legally in accordance with Federal, State, and local laws and regulations.

B. Lamps: Legally dispose of lamps in accordance with EPA guidelines.

1. Contractor shall be responsible for the careful removal of all lamps and fluorescent tubes without breakage from existing lighting fixtures.

2. Lamps removed from fluorescent, metal halide, mercury vapor, and sodium fixtures that do not have green end caps shall be placed by the Contractor in cardboard boxes. The Contractor shall label each box with type and quantity of lamps in each box and seal the box. Boxes shall be properly disposed of.
3. Broken, fluorescent, metal halide, mercury vapor, and sodium lamps without green end caps shall be immediately and carefully cleaned up by the Contractor, placed in a 55 gallon steel drum and properly disposed of by the Contractor

3.9 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF SECTION 260506

SECTION 260508 - COORDINATION AMONG TRADES, SYSTEMS INTERFACING AND CONNECTION OF EQUIPMENT FURNISHED BY OTHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 COORDINATION

A. The Contractor is expressly directed to read the General Conditions and all sections of these specifications for all other trades and to study all drawings applicable to his work, including Architectural, Plumbing Fire Protection, Mechanical and Structural drawings, to the end that complete coordination between trades will be affected. Each Contractor shall make known to all other contractors the intended positioning of materials, raceways, supports, equipment, and the intended order of his work. Coordinate all work with other trades and proceed with the installation in a manner that will not create delays for other trades or affect the Owner's operations.

B. Special attention to coordination shall be given to points where raceways, fixtures, etc., must cross other ducts or conduit, where lighting fixtures must be recessed in ceilings, and where fixtures, conduit and devices must recess into walls, soffits, columns, etc. It shall be the responsibility of each Contractor to leave the necessary room for other trades. No extra compensation or time will be allowed to cover the cost of removing fixtures, devices, conduit, ducts, etc. or equipment found encroaching on space required by others.

C. The Contractor shall be responsible for coordination with all trades to ensure that they have made provision for connections, operational switches, disconnect switches, fused disconnects, etc., for electrically operated equipment provided under this or any other division of the specifications, or as called for on the drawings. Any connection, circuiting, disconnects, fuses, etc. that are required for equipment operation shall be provided as a part of this contract.

D. Review and coordinate connections to electrically operated equipment furnished by other trades with project contract documents, shop drawings, submittals, and installation instructions. Notify architect in writing of discrepancies prior to proceeding with work. No extra payment will be allowed for relocation of fixtures, devices, conduit, and equipment not installed or connected in accordance with the above instructions.

E. If any discrepancies occur between accompanying drawings and these specifications and drawings and specifications covering other trade's work, each trade shall report such discrepancies to the Architect far enough in advance so that a workable solution can be presented. No extra payment will be allowed for relocation of fixtures, devices, conduit, and equipment not installed or connected in accordance with the above instructions.

F. In all areas where air diffusers, devices, lighting fixtures and other ceiling-mounted devices are to be installed, the Mechanical Trade(s), the Electrical Trade and the General Trades shall coordinate their respective construction and installations so as to provide a combined symmetrical arrangement that is acceptable to the Architect and Engineer. Where applicable, refer to reflected ceiling plans. Request layouts from the Architect or Engineer where in doubt about the potential acceptability of an installation.

G. Refer to equipment schedules and details on all contract documents for additional information for mechanical and plumbing connections. Provide labor and materials for a complete and operable system.

H. Provide equipment overcurrent protection and feeder sizes for equipment furnished by this or other trades or by Owner per actual equipment nameplates and installation instructions.

I. Provide WP/WR maintenance receptacle within 25 ft of each outdoor and roof mounted mechanical unit. Coordinate installation locations with final equipment layout provided by Mechanical Contractor. Provide GFI branch circuit to nearest panelboard, UON on drawings.

1.3 INTERFACING

A. Each Electrical Trade, Specialty Controls Trade, Mechanical Trade, and the General Trades, etc., shall insure that coordination is affected relative to interfacing of all systems. Some typical interface points are (but not necessarily all):

1. Connection of all controls to equipment.
2. Electrical power connections to electrically operated (or controlled) equipment.
3. Electrical provisions for all equipment provided by other trades or suppliers within this contract.
4. Contractor is to provide conduit whips and back boxes, as needed, to power systems furniture.
5. Coordination of connection of Telecommunications (voice, data, video) lines to Owner’s existing or new service.
6. Connection of utility electrical service to Owner's existing or new services.

1.4 CONNECTION OF EQUIPMENT FURNISHED BY OTHERS

A. Each Contractor shall make all connections to equipment furnished by others, whenever such equipment is shown on any part of the drawings or mentioned in any part of the Specifications, unless otherwise specifically specified hereinafter.

B. All drawings are complementary, one trade of the other. It is the Contractor's responsibility to examine all drawings and specifications to determine the full scope of his work. The project Engineers have arranged the specifications and drawings in their given order solely as a convenience in organizing the project, and in no way shall they imply the assignment of work to specific trades, contractors, subcontractors, or suppliers.

C. Supervision to assure proper installation, functioning and operation shall be provided by the Contractor furnishing the equipment or apparatus to be connected.

D. Items indicated on the drawings as rough-in only (RIO) will be connected by the equipment supplier or Owner, as indicated. The Contractor shall be responsible for rough-in provisions only as indicated. These rough ins shall be in accord with the manufacturer's or supplier's requirements.

E. For items furnished by others, relocated, or RIO, the Contractor shall obtain from the supplier or shall field determine as appropriate, the exact rough-in locations and connection sizes for the referenced equipment.

F. The Contractor shall be responsible for coordinating with the General and all other trades, as necessary, to determine any and all final connections that he is to make to equipment furnished by others.

G. Sides of cable, basket and ladder trays shall not be obstructed with special attention to pipes, ductwork, raceways, equipment, cables, etc.

END OF SECTION 260508

SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER, CONDUCTORS, CABLES, SPLICING DEVICES AND CONNECTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. This section of the Specifications covers all of the electrical power, lighting, and control power (line voltage) conductors, but does not include communications, data, or signal system conductors, which are specified separately in these specifications.

C. All conduits installed without conductors shall have a 200 lb. test nylon string installed for future use, tied off securely at each end.

D. No more than 40% conduit fill is permitted for any conduit system, including video, intercom, data, power, or other signal circuits unless specifically indicated otherwise on the plans.

E. No more than seven conductors (six current-carrying and one ground) shall be installed in a conduit except for switch legs and travelers in multi-point switching arrangements. Multi-wire branch circuits with a shared neutral are not allowed.

F. If multiple circuits are pulled in a single homerun, a dedicated neutral shall be provided for each phase conductor. In these cases, a maximum of seven conductors (six current carrying and one ground) are permitted in a single conduit. Conductors shall be derated per NEC.

G. Intentional or unintentional painting of exposed low-voltage and/or line-voltage cabling is prohibited. The contractor shall ensure that exposed cabling is adequately protected from direct painting or overspray whether painting is required within the electrical specifications or required by other disciplines/trades. The contractor shall review the painting requirements for all disciplines and shall provide cabling protection as required. Where exposed cabling is being installed in exposed ceiling or wall spaces that are required to be painted, the contractor shall provide alternate options for cable colors and shall provide submittals for such cabling to engineer for approval.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Coordinate paragraph below with qualification requirements in Division 01 Section "Quality Requirements" and as supplemented in "Quality Assurance" Article.

B. Qualification Data: For testing agency.

C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. Alpha Wire Company.
3. American Insulated Wire Corp.; a Leviton Company.
4. Belden Inc.
5. Cerro Wire LLC.
6. Encore Wire Corporation.
7. General Cable Technologies Corporation.
8. General Cable Corporation.
9. Senator Wire & Cable Company.
10. Southwire Company.

B. All conductors shall be 98% conductive annealed copper unless otherwise noted, UL listed and labeled. Comply with ANSI/NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation:

1. Comply with ANSI/NEMA WC 70/ICEA S-95-658.
2. Lighting and receptacle branch circuits shall be Type THW, THHN or THWN insulation.
3. All feeders shall be Type THW or THWN of the size as shown on the Contract Drawings.
4. THHN wiring shall only be installed in overhead, dry or damp locations.
5. THWN or THW wiring shall be used for all circuits pulled in underground or other wet locations.

D. Conductor sizes indicated on drawings are based upon 75 degree C rating.

E. Minimum branch circuit or feeder size shall be not less than #12 AWG copper wire or of the sizes shown on the drawings.

F. Conductors #10 AWG and smaller sizes of wire shall be solid. Conductors #8 AWG and larger sizes shall be stranded.

G. Conductors for fire alarm wiring shall be stranded and in full compliance with NEC 760. All fire alarm conductors shall be installed within conduit and enclosed junction boxes.

H. All wire on the project shall be new, in good condition, and shall be delivered in standard coils or reels.

I. The color of the wire shall be selected to conform to Section 210-5 of the latest edition of the National Electrical Code. Power conductors of all sizes shall follow the color coding scheme listed under PART 3, IDENTIFICATION below.

J. Conductors used for motor connections and connections to vibrating or oscillating equipment shall be extra flexible.

K. Conductors for main ground from neutral bus, equipment grounding bus, building steel, grounding grid and main cold water pipe connection shall be bare copper.

L. All conductors shall be identified by color code and by means of labels placed on conductors in all junction boxes and at each terminal point with Brady, Ideal, T & B or approved equivalent labels indicating source, circuit number or terminal number.

M. Branch wiring and feeder conductors that are greater than 50' in length shall be increased at least one size to compensate for voltage drop. All circuits shall be installed and sized for a maximum 2% voltage drop. As calculated using 80% of the supply breaker rating as the load. Adjust conductors and conduit size accordingly for actual field installed conditions.

N. No aluminum conductors shall be used.

O. MC cable and AC cable shall not be permitted.

2.2 SPLICING DEVICES & CONNECTORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. 3M; Electrical Products Division.
2. AFC Cable Systems, Inc.
3. Burndy
4. Gardner Bender.
5. Hubbell Power Systems, Inc.
6. Ideal Industries, Inc.
7. ILSCO.
8. NSi Industries LLC.
9. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
10. Reliable
11. T&B
12. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

C. Splicing devices for use on #10 AWG and smaller conductors shall be pressure type such as T&B "Sta-Kon".

D. Wire nuts shall be spring pressure type, insulation 600V, 105°C insulation, up to #8 AWG. Greater than #6 AWG shall be a compression type connection, 600V insulation, cold shrink tubing, taped to restore full insulation value of the wire being spliced.

E. Pressure crimp-applied ring type (or fork with upturned ends) terminations shall be employed on motor and equipment terminals where such terminals are provided on motor and equipment leads or on all stranded wire terminations using #10 AWG or smaller conductors.

F. Splices, where necessary, shall be made with hydraulically-set "Hy-press" or equivalent crimped connectors. All splices shall be insulated to the full value of the wiring insulation using a cold-shrink kit or the equivalent in built-up materials.

G. Large connectors (lugs) at terminals shall be mechanical type, hex-head socket, or crimp-on style, installed per the manufacturer's recommendations.

H. Underground connections made between bare ground wires or to ground rods shall be exothermically welded, "Cadweld" or equivalent.

I. No aluminum splicing devices or connectors shall be used.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION MATERIAL APPLICATIONS

A. Feeders: Copper Stranded.

B. Branch Circuits: Copper. Solid for #10 AWG and smaller; stranded for #8 AWG and larger.

C. Conductors used for motor connections and connections to vibrating or oscillating equipment shall be extra flexible stranded.

D. Lighting and receptacle branch circuits shall be Type THW, THHN or THWN insulation.

E. All feeders shall be Type THW or THWN of the size as shown on the Contract Drawings.

F. THHN wiring shall only be installed in overhead, dry or damp locations.

G. THWN or THW wiring shall be used for all circuits pulled in underground or other wet locations.

H. Class 1 Control Circuits: Type THHN-THWN, in raceway.

I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.2 INSTALLATION

A. Clean out raceway system before pulling conductors.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. The pulling of all wires and cable on this project shall be performed in strict compliance with applicable sections of the National Electrical Code. No conductor entering or leaving a cabinet or box shall be deflected in such a manner as to cause excess pressure on the conductor insulation. Conductors shall only be installed after insulating bushings are in place.

E. The radius of bending of conductors shall be not less than eighteen times the outside diameter of the conductor insulation or more, if recommended by the manufacturer.

F. Conductors installed within environmental air plenums shall be per NEC. Article 800 and other applicable codes, with FEP-type insulation or an approved equivalent. Also provide plenum-rated tie-wraps where plastic straps or other supports, etc., are installed in plenum areas.

G. Where indicated, systems and control conductors that are installed exposed shall not be routed across ceilings or ductwork. They shall be held up against building structure or against permanent support members. They shall be installed in such a manner that they do not interfere with the access to or operation of equipment or removal of ceiling tiles. Nylon tie-wraps shall be installed in such a manner so as to bundle conductors neatly, allowing runouts of single conductors or groups to drop down to equipment served. Install grommeting where dropping out of trays or into panels or service columns. Install sleeves with bushings where penetrating partitions. Firestop sleeves with approved material. Do not penetrate firewalls if so, indicated on plans. Refer to the drawings for support requirements and details on routing exposed communications conductors.

H. Conductors for isolated power systems shall be installed in as short a run of conduit as practicable. No pulling soap shall be used on conductors in isolated power systems.

I. Where conductors are installed in industrial facilities, they shall be per JIC standards.

J. Maximum permissible pulling tensions, as recommended by the manufacturer for any given type of cable or wire installed shall not be exceeded. Utilize special remote readout equipment to ensure compliance. Use particular caution when installing twisted pair data cable or fiber optic cables -- forces permitted for pulling in are typically very low for these cable types.

K. All cables and wiring, regardless of voltage, installed in manholes or cable vaults shall be routed in such a manner to provide a minimum of 6 feet of slack cable for future splicing. Install cables along walls by utilizing the longer route from entry to exit. If both routes are symmetrical, provide a loop of cable secured to wall. All cables shall be tied to insulated cable supports on wall-mounted racks, spaced a maximum of three feet apart.

L. Where multi-wire branch circuits are allowed on the drawings, the phases and neutral shall be wire-tied together in the panelboard and in all pull boxes.

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

C. Wiring at Outlets: Install conductors at each outlet with at least 12 inches of slack.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections and prepare test reports.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Perform insulation resistance (megger) testing for all bus duct and feeders in accordance with NETA ATS. Testing may be witnessed by the Engineer and/or Commissioning agent. Schedule all tests with Architect with ample notice.
3. Megger tests shall be performed at a DC voltage of 1,000 volts for 600 volt rated equipment, and at a DC voltage of 500 volts for 120-300 volt rated equipment. Minimum acceptable (temperature corrected) resistance is 25 megaohms for 120-300 volt rated equipment and 100 megaohms for 600 volt rated equipment and wiring.
4. Test instruments shall be calibrated to national standards within the last 12 months.

D. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors #3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

E. Test and Inspection Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Results that comply with requirements.

3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

F. Cables will be considered defective if they do not pass tests and inspections. Remove and replace malfunctioning units and retest as specified above.

G. Submit test results to Architect and Engineer for approval

3.5 IDENTIFICATION

A. Color coding distribution voltage conductors, 600 volt or less

B. Conductors, in all sizes of cable, shall have continuous insulation color(s) from the manufacturer. Conductor jackets, in all sizes of cable, shall be provide in black, white, red, blue, green, yellow, brown, orange and gray from the manufacturer. Tapped ends shall not be acceptable.

1. Conductors shall be color coded as follows:

a. 120/208 Volt Conductors

1) Phase A: Black
2) Phase B: Red
3) Phase C: Blue
4) Neutral: White
5) Ground: Green
6) Isolated Ground: Green/Yellow

b. 277/480 Volt Conductors

1) Phase A: Brown
2) Phase B: Orange
3) Phase C: Yellow
4) Neutral: Gray or White with Brown tracer
5) Ground: Green
6) Isolated Ground: Green/Yellow

c. Note: Further identify isolated power conductors with ½" wide purple tape at all terminations and junctions.

2. Fire Alarm Wiring: Red
3. Signal voltage wiring color coding shall be consistent throughout the project and shall match existing equipment and standards where applicable. Color coding for each system shall be unique.
4. Conductors within enclosures that may be energized when enclosure disconnect is off - yellow or taped with 1/2" yellow tape every 6" of length, inside enclosure. Provide lamacoid plate warning sign on front of enclosure where this condition occurs.
5. DC Wiring: Positive: Light Blue
Negative: Dark Blue

C. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Service Entrance Electrode Grounding System.
2. Underground distribution grounding.
3. Foundation steel electrodes.
4. Communications Grounding System.

B. All metallic conduit, raceways, cable trays, wireways, supports, cabinets and equipment shall be grounded in accordance with the latest National Electrical Code, as shown on the Contract Drawings and in accord with the requirements of the local authority having jurisdiction, as applicable.

C. The size of the equipment grounding conductors, grounding electrode conductors and service grounding conductors shall be not less than that given in Article No. 250 of the National Electrical Code, and/or as shown on the Contract Drawings. Where ungrounded conductor sizes are increased to minimize voltage drop, grounded conductor sizes shall be increased in the proper proportion.

D. Grounding bus and non-current carrying metallic parts of all equipment and raceway systems shall be securely grounded by connection to common ground.

E. The service entrance main ground bus shall also be connected to the main cold metallic water pipe within three feet of where it enters the building, on both the house and street sides of the main shut-off valve with a properly sized bonding jumper. A properly sized bonding jumper shall also be provided to the frame of any steel structure utilized in the construction. The steel frame of the building (if any) shall be made electrically continuous.

F. All ground electrode systems shall be installed in accordance with manufacturer's recommendations, UL listings, ANSI standards, National Electrical Code and National Electrical Safety Code.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.

4. Grounding arrangements and connections for separately derived systems.
5. Grounding for sensitive electronic equipment.

B. Qualification Data: For testing agency and testing agency's field supervisor.

C. Field quality-control reports.

1.5 CLOSEOUT DOCUMENTS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

B. In addition to items specified in Section 260501 "CLOSEOUT DOCUMENTS," include the following:

1. Instructions for periodic testing and inspection of grounding features at building master ground bus and electrodes based on NFPA 70B.
2. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
3. Include recommended testing intervals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

C. Listing and labeling: Provide products specified in this Section that are listed and labeled.

D. Comply with NECA’s “Standard of Installation.”

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS:

A. Subject to compliance with requirements, provide products by one of the following:

1. Erico
2. ILSCO
3. Cadweld
4. Burndy
5. Therm-O-Weld
6. T&B
7. O.A. Co.
8. Lyncole XIT Grounding
9. Superior Grounding Systems
10. LEC Inc

2.3 CONDUCTORS

A. Comply with Specification Section 260519, LOW-VOLTAGE ELECTRICAL POWER, CONDUCTORS, CABLES, SPLICING DEVICES AND CONNECTORS.

B. Ground Bus-Bar:

1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar per EIA/TIA standards.

2. Ground Bus Bar: Copper, minimum 1/4-inch-thick by 4 inches wide with four (2) rows of 9/32-inch holes spaced 1-1/8 inches apart. Minimum length of 18” or as indicated on Contract Drawings
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600V. Lexan or PVC, impulse tested at 5000 V.

C. Ground wires and cables shall be of the AWG sizes shown on the Contract Drawings or shall be sized in accordance with the prevailing codes. All ground wires and cables shall be copper.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.

1. Pipe connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar per EIA/TIA standards.

E. All grounding fittings shall be heavy cast bronze or copper of the mechanical type except for underground installations or interconnection of grounding grid to cable, columns, and ground electrodes, which shall be thermically welded type as manufactured by Cadweld, Burndy Co., Therm-O-Weld, or approved equivalent.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch in diameter by 10 feet long, molecularly bonded copper to high-strength steel core, copper thickness per UL/ANSI.

B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with non-hazardous electrolytic chemical salts.

1. Termination: Factory-attached #4/0 AWG bare conductor at least 48 inches long.
2. Backfill Material: Electrode manufacturer’s recommended material.

2.6 CHEMICAL GROUNDING ELECTRODE SYSTEM:

A. The ground electrode system shall be as specified herein. The system shall not require maintenance throughout the expected life span of the materials.

B. Ground system shall be an electrolytic rod type, as manufactured by Lyncole XIT Grounding, Superior Grounding Systems, LEC, Inc. (Chem-Rod), or approved equivalent. Electrode(s) shall be placed as shown on the plans, installed exactly per manufacturer's recommendations. Electrodes shall be installed vertically, 12 feet of overall length (or length as indicated), set in a drilled hole and backfilled per manufacturer's instructions with a special clay slurry surrounding the rod. Provide a concrete protection box with cast iron grate for the top of the rod termination. Ground system shall be per the following:

1. Manufacturer: Lyncole XIT Grounding (or approved equivalent).
2. Source: Lyncole XIT Grounding, 22412 S. Normandie Ave., Torrance, CA 90502 1-800-962-2610
3. Shaft Configuration: Straight.
4. Shaft Length: 12 feet (or as otherwise indicated).
5. Listings: U.L.-467J, ANSI 633.8.
6. Material: Type K Copper.
7. Construction: Hollow tube, 2.125" O.D., chemical filled with non-hazardous metallic salts.
8. Weight 3.5 lbs. per foot of length, nominal.

9. Ground Wire Termination: Exothermic ("Cadweld" by Contractor) connection to 4/0 conductor, with U-bolt with pressure plate provided as test point.
10. Average Life Expectancy: 25 Years.
11. Model Number: K2-(length)CS.
12. Provide grounding system with the following components: protective box, backfill material. Box to be concrete with cast iron, tamper-resistant lid, backfill to be "Bentonite" clay.

C. Installation of Pipe Ground System:

1. Pipe ground systems shall be installed exactly as required by the system manufacturer. The Contractor shall be diligent to observe the excavation, sealing tape removal, slurry backfill and all other critical requirements.
2. Note: NEVER USE SAND OR ORDINARY EARTH AS A BACKFILL MATERIAL
3. Pipe grounding system shall be warranted unconditionally by the Contractor for a period of one year from the date of substantial completion.

PART 3 - EXECUTION

3.1 GENERAL

A. All metallic conduit, raceways, wireways, supports, cabinets and equipment shall be grounded in accordance with the latest issue of the National Electrical Code, as shown on the Contract Drawings and in accord with the requirements of the local authority having jurisdiction, as applicable.

B. The size of the equipment shall be not less than that given in Article No. 250 of the National Electrical Code, and/or as shown on the Contract Drawings.

C. Grounding bus and non-current carrying metallic parts of all equipment and raceway systems shall be securely grounded by connection to common ground.

D. All outlet, junction and pull boxes shall be grounded with pigtail to the equipment grounding conductor.

3.2 APPLICATIONS

A. Conductors: Install solid conductor for #10 AWG and smaller, and stranded conductors for #8 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, #3/0 AWG minimum or as indicated on drawings, whichever is larger.

1. Bury at least 24 inches below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 18 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.3 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral bus and ground bus.

3.4 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Where NEC requires grounding for a separately derived system, ground according to NEC.

B. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.5 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Handholes: Install a driven ground rod through handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide #1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

3.6 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Busway Supply Circuits
8. Computer and Rack-Mounted Electronic Equipment Circuits.

B. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure and install a

separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

G. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide #4/0 minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-18-inch grounding bus.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

H. Metal Poles Supporting Outdoor Lighting Fixtures: Install a copper-clad steel, 3/4 inch in diameter by 10 feet long, ground rod and a separate insulated equipment grounding conductor at each pole in addition to grounding conductor installed with branch-circuit conductors.

I. Ground Loop/Ring: Install ground-level, potential equalization conductor and extend around the perimeter of structure. Refer to sheet detail for additional requirements.

1. Bury ground ring not less than 24 inches from building foundation.
2. Bond ground terminals to the ground loop.
3. Bond grounded building systems to the ground loop conductor within 12 feet of grade level.

3.7 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. All grounding conductors shall be protected from mechanical injury and shall be rigidly supported. Where ground conductors are run through flexible conduit and through panelboard switchboard or motor control center feeders, they shall be securely bonded to such conduit thru the use of grounding bushings at the entrance and exit. All connection of equipment shall be made with an approved type of solderless connection and same shall be bolted or clamped to equipment or conduit.

C. Equipment ground connections to GFI circuit breakers shall be carried and bonded to each outlet on the circuit. Provide a separate equipment grounding conductor with green color insulation.

D. Equipment grounding conductors shall be routed to lighting fixtures, devices, receptacles, electric heaters, furnace, and other equipment. Equipment grounding conductors not exceeding #6 AWG in size shall be green. Those larger than #6 AWG shall be green (same color everywhere) taped 4" at each termination, pull and junction boxes.

E. Resistance to the grounding at the service entrance equipment shall be in accordance with the NEC for style of construction and shall not exceed five ohms as measured by the described testing method.

F. All circuits shall have a separate grounding conductor, except as otherwise noted.

G. When grounding systems are completely installed and all grading in the area of the service grounding electrode has been completed up to finish elevations, perform a fall-of potential or other approved test to determine actual system resistance to earth. Report results to the Engineer in writing. Refer to testing provisions in this section of specifications.

H. Where separately derived systems are utilized as part of the power distribution network, the neutral leg of the secondary side of generators, transformers, etc., shall be connected to a grounding electrode in accordance with the manufacturer's recommendations.

I. The Contractor shall ensure that the ground return path thru building structural steel or other means is electrically continuous back to the service grounding electrode and is of adequate capacity and impedance to carry the maximum expected fault or other current. Where no electrically continuous steel building frame is available, the Contractor shall provide a properly sized ground bar and ground conductor routed back to the main facility ground bus.

J. Where a building's steel frame is made electrically discontinuous by masonry breaks (as at firewalls, etc.), the Contractor shall provide an accessible thermically welded bonding jumper of #500Kcmil copper to bond the building steel frame sections together, making the entire steel frame electrically continuous. The installation of these bonding jumpers shall be reviewed by the Engineer prior to their being covered by construction.

K. Grounding connections shall never be made to fire protection, natural gas, flammable gas or liquid fuel piping, except where specifically indicated on the plans.

L. Where dielectric fittings are utilized in piping systems, the piping system shall not be utilized as a ground path. Bonding jumpers shall not be utilized to bridge over such fittings. Piping systems shall not be utilized as ground paths except where specifically required by codes in the case of water piping.

M. At all metallic outlet, junction and pull boxes, bond the equipment grounding conductor to the box.

N. Ground Rods: Drive rods until tops are 12 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
3. Provide well access for testing at one (1) rod.

O. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.

1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

P. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

Q. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

R. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

S. Grounding for Steel Building Structure: Provide a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

T. Concrete-Encased Grounding Electrode (Ufer Ground): Provide and fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than #4 AWG.

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

U. Perform ground testing, log results, and provide reports of test points, test values, and procedure as required by engineer and/or local authority having jurisdiction. All systems shall be grounded to maintain leakage current below levels required by applicable codes and standards.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by four-point fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.9 SERVICE GROUND TESTING PROCEDURE

A. The actual resistance to earth of the service grounding electrode shall be measured by the Contractor via the fall-of-potential method. This testing shall be accomplished after the grounding electrode has been completely installed and the finished grade is achieved.

B. The results of the testing shall be summarized in a written report by the Contractor, which shall be forwarded to the Engineer for review. The report shall also be included with the operation and maintenance manuals for the Owner's information and future reference. This report is to also contain a detailed description and illustrations of the testing procedure, along with the name and model number of the testing instrument(s).

C. For the actual testing, the Contractor shall follow the procedures outlined below. A self-contained instrument such as a "Megger" or "Ground OHMMETER" shall be used that is designed to eliminate the influence of stray current effects on the accuracy of the measurements.

D. Connect one side of the instrument to the grounding electrode conductor where it connects to the facility main ground bus (point C1). Disconnect and isolate the grounding electrode conductor for the test.

E. Drive a copperweld reference electrode probe (point C2) into earth between 300 and 500 feet away from C1 and connect to measurement instrument.

F. Drive the movable grounding probe (C3) into earth at ten equally spaced intervals, in a straight line between C1 and C2 points and note the E/I=R resistance readings on a graph at each point.

G. The resistance measurements in OHMS taken from the flat part of the curve shall be averaged to determine the true grounding electrode resistance to earth.

H. At completion of testing, remove reference electrode C2 and all temporary wiring and connections.

I. If actual measurements of grounding electrode indicate a resistance greater than three OHMS, contact the Engineer for instructions. If deemed necessary by the Engineer, additional electrodes shall be placed, and the measurement process repeated until the desired ground potential is achieved.

J. Record results for each step in the testing process and include a full report in close-out documentation.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section Includes the following:
1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.
3. Isolation pads.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit

C. LFMC: Liquid-tight flexible metal conduit

D. GRS: Galvanized rigid steel conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this project, with a minimum structural safety factor of five times the applied force.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.
5. Concrete Based for Equipment.
6. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
7. Delegated-Design Submittal: For hangers and supports for electrical systems.

8. Include design calculations and details of trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which hangers and supports will be attached.
3. Size and location of initial access modules for acoustical tile.
4. Items penetrating finished ceiling, including the following:
5. Lighting fixtures.
6. Speakers.
7. Sprinklers.
8. Access panels.
9. Projectors.

1.7 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
2. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Device Box Mounting Brackets: Factory-fabricated sheet steel brackets for support of device boxes adjacent to or between studs.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper B-Line, Inc.; a division of Cooper Industries.
b. ERICO International Corporation.
c. Unistrut; a division of Atkore.

F. Through-Stud Cable and Raceway Support Clips: Factory-fabricated spring steel clip for cables or raceways where run horizontally through metal studs.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper B-Line, Inc.; a division of Cooper Industries.
b. ERICO International Corporation.
c. Unistrut; a division of Atkore.

G. Roof-mounted Raceway Support Blocking: Factory-fabricated support blocking for use under roof-mounted raceways. Wedge-shaped blocking constructed of 100% recycled UV-resistant Rubber with integral galvanized steel strut to accept raceway support clips.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Cooper B-Line, DURA-BLOK series components or a comparable product by one of the following:

a. Caddy Pyramid ST, ERICO International Corporation.
b. Unistrut; a division of Atkore.

H. Tee Bar Grid Box Hanger: Factory-fabricated metal electrical box hanger for supporting boxes at locations between ceiling system t-grid components. Height adjustable for various electrical box depths. Attached to ceiling tee bar with screws or integral clamp for stability. Includes tab for independent support wire attachment.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper B-Line, Inc.; a division of Cooper Industries.
b. ERICO International Corporation.
c. Unistrut; a division of Atkore.

I. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

J. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, or steel with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.

3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Solid, threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

2.3 VIBRATION ISOLATION PADS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Korfund Maxi-Flex Pads or a comparable product by one of the following:

1. Mason.
2. Unisorb.

B. Pads: Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NFPA 70, NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except where requirements of this Section are more stringent.

B. Maximum Horizontal and Vertical Support Spacing for Raceway(s): Space supports for EMT, and GRS as required by NFPA 70.

C. Minimum Hanger Rod Size for Raceway Supports: Minimum rod size shall be 1/4 inch in diameter.

D. Single Raceways:

1. For Raceways 1-1/4-inch and smaller: Install adjustable steel band hanger suspended on threaded rod.
2. For Raceways larger than 1-1/4-inch: Install trapeze-type supports fabricated with steel slotted support system suspended on threaded rods. Size trapeze members, including the suspension rods, based on the support required for the size, and loaded weight of the conduits.

a. Secure raceway or cable to support with two-bolt conduit clamps or single-bolt conduit clamps using spring friction action for retention in support channel.

E. Multiple Raceways: Install trapeze-type supports fabricated with steel slotted support system suspended on threaded rods, where multiple raceways are run vertically or horizontally at the same elevations. Size trapeze members, including the suspension rods, based on the support required for the number, size, and loaded weight of the conduits. Space them as required for

the smallest conduit to be supported. Size so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps or single-bolt conduit clamps using spring friction action for retention in support channel.

F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 EXAMINATION

A. Examine areas and equipment to receive vibration isolation devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SUPPORT INSTALLATION

A. Comply with NFPA 70, NECA 1 and NECA 101 for installation requirements except where requirements of this Article are more stringent.

B. Fasten junction, pull and devices boxes securely to the building construction, independent of raceway system.

C. Install Device Box Mounting Brackets supported between two studs. All device boxes shall be attached to two studs, device box stabilizers shall not be acceptable.

D. Install Through-Stud Cable and Raceway Support Clips where cables or raceways run horizontally through metal studs.

E. Install Tee Bar Grid Box Hanger supported between two ceiling grid tee bars where devices boxes are located flush in recessed suspended ceilings.

1. Install at least one independent support rod from box hanger to structure.

F. Install Roof-mounted Raceway Support Blocking where raceways run on across roofing.

1. Coordinate installation of roof supports with items specified in Division 07 Section "Roof Accessories." Provide products compatible with rooftop materials included in the Work.

G. Provide minimum of two lock nuts per threaded support rod except where lock nut tightens against a threaded socket, one locknut may be used.

H. Support raceways at a distance above suspended ceilings to permit removal of ceiling panels and luminaires.

I. Locate raceways so as not to hinder access to mechanical equipment.

J. Do not secure conductors, raceways, or supports to suspended ceiling hanger rods or wires.

K. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb. (90 kg).

L. Mounting and Anchorage of Surface-Mounted or Recessed-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To New Concrete: Bolt to concrete inserts. Where support anchors are required, establish their type, and locate in concrete construction before concrete is poured, if possible. Fit each hanger rod with a nut at its upper end and set nut in a universal

concrete insert in the form. Where supported weight exceeds holding strength of a single insert, pass rods through top slot of inserts and interlock with reinforcing steel. Also, where particularly heavy loads are to be supported, suspend hanger rod or rods from a structural angle spanning two or more inserts and securely bolted thereto to distribute the weight.

2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
3. To Existing Concrete: Expansion anchor fasteners.
4. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or Spring-tension clamps.
5. To Light Steel: Sheet metal screws.
6. For Surface-Mounted Items on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to structure by means that meet seismic-restraint strength and anchorage requirements. Attachment to gypsum wall board is not acceptable as sole support means; slotted-channel rack solidly attached to structure or light-gauge metal framing at both ends is required.
7. For Recessed-Mounted Items in Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices to intermediate light-gauge metal framing members on each side of device or provide slotted-channel racks within hollow wall attached to structure by means that meet seismic-restraint strength and anchorage requirements. Attachment to gypsum wall board is not acceptable as sole support means.

M. Do not support any items (equipment, piping, conduit, etc.) exceeding 2 inches in diameter from the bottom of slabs. Where intermediate supports are required between structural members, use slotted steel channels support systems attached to beams or joists in order to avoid attachment to slabs.

N. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars. Verify reinforcing locations with Structural Engineer. X-Ray existing concrete structures as required.

3.4 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.5 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 3 inches larger in all directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND FITTINGS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. This section is intended to specify the raceways, conduit, conduit fittings, hangers, junction boxes, splice boxes, specialties, and related items necessary to complete the work as shown on the drawings and specified herein.

B. This section specifies basic materials and methods and is a part of each Division 26, 27 and 28 Sections that implies or refers to electrical raceways specified therein.

C. The types of raceways specified in this section include the following:

1. Steel electrical metallic tubing (EMT)
2. Galvanized rigid steel conduit (GRS or RMC)
3. Intermediate metal conduit (IMC)
4. Rigid aluminum conduit (RAC)
5. Flexible metal conduit (FMC)
6. Liquid-tight flexible metal conduit (LFMC)
7. Rigid nonmetallic conduit (RNC)
8. Surface mounted metal raceway (SMR)
9. Metal wireways and auxiliary gutters.
10. Duct banks, and their construction.

D. All raceways, as listed above and otherwise specified herein shall be provided in compliance with latest editions of all applicable UL, NEMA, NEC and ANSI standards. All conduit, raceways and fittings shall be Underwriters Laboratories listed and labeled or bear the listing of an agency acceptable to the local authority having jurisdiction.

E. Conduit and raceways, as well as supporting inserts in contact with or enclosed in concrete shall comply with the latest edition of all ACI standards and the equipment manufacturer's recommendations for such work.

F. The decision of the Engineer shall be final and binding in any case where a question or inquiry arises regarding the suitability of a particular installation or application of raceways, supports or materials, if other than outlined herein.

G. Minimum size of conduit shall be 3/4" trade size for power and 1” trade size for voice/data/TV, unless otherwise noted on the drawings. All conduit and raceways shall be sized for the number of conductors contained, in accord with the latest edition of the National Electrical Code or any other applicable standards.

H. The installer of raceway systems shall avoid the use of dissimilar metals within raceway installations that would result in galvanic-action corrosion.

I. PVC or other non-metallic conduit shall be rated for the maximum operating temperature that could be developed by the conductors it encloses, while in normal operation.

J. All empty conduit installed anywhere shall have pull-strings installed for future cabling installation. Coordinate with vendors and provide extra pull-strings as required to ensure that when cabling is pulled, conduit still pull-strings installed for future use.

K. Fire Alarm Cabling (conduit): All fire alarm conductors shall be installed within conduit and enclosed junction boxes. Provide a completely separate raceway system from power wiring or other raceway systems. All concealed conduit shall be manufactured red – no field painting will be accepted. Exposed conduit in finished spaces shall be painted to match adjacent finishes.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.4 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's product data for raceways, conduits, outlet boxes, and wireways.

B. Shop Drawings:

1. Submit Shop Drawings of the complete metal surface raceway system.
2. Shop Drawings shall include sizes and lengths of raceways, inside corners, outside corners, end caps, raceway cover spacing, grounding, branch circuiting and wiring including locations of service entrances, receptacle types and manufacturers, receptacle spacing, and receptacle labeling with proper voltage, phase, circuit, and panelboard designations as indicated on the Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney; a brand of EGS Electrical Group.
6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company; a division of John Maneely Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. STEEL ELECTRICAL METALLIC TUBING

1. Electrical metallic tubing (EMT), of corrosion-resistant zinc coated cold rolled steel tubing shall be permitted for concealed installation in dry interior locations.
2. EMT shall not be installed underground, in concrete slabs or where exposed to physical damage. EMT shall be permitted for exposed work in mechanical and electrical rooms and other exposed structure areas where not subjected to physical damage, as determined by the Engineer. All exposed conduit and fittings located within 8'-0" of finished floor shall be rigid steel with threaded connectors.
3. Comply with ANSI C80.3 and UL 797.

D. GALVANIZED RIGID STEEL CONDUIT

1. Galvanized rigid steel conduit (GRS or RMC) shall have a zinc coating inside and outside by means of hot-dip galvanizing.
2. Use GRS where subject to physical damage for exposed work in mechanical spaces, within factory or other industrial work areas, for exposed fit-up work on machinery, for exposed exterior damp or wet location work, in hazardous atmospheres, in exterior underground locations where installed beneath roadways, where ells occur in underground PVC conduits, or where turning out of concrete encased duct banks, and at other locations as specifically called out on the drawings.
3. GRS shall be used for all building interior power wiring or cables of over 600 Volts.
4. GRS shall be delivered with plastic protectors on the threads.
5. GRS threads shall not have any coating which will reduce conductivity of the joint.
6. Couplings, bends, elbows, and fittings shall be subject to the same requirements as for the straight lengths.
7. Comply with ANSI C80.1 and UL 6.
8. "Kwik-Couple" type fittings are not acceptable.

E. INTERMEDIATE METAL CONDUIT

1. Unless otherwise indicated on the drawings, intermediate metal conduit (IMC) may be used in any location in place of rigid galvanized steel conduit, as permitted by codes, and as approved by the Engineer.
2. Manufactured in conformance with UL standards.

F. RIGID ALUMINUM CONDUIT

1. Rigid aluminum conduit shall be permitted for installation indoors in dry locations only. Under no conditions shall it be cast into concrete slabs or pass thru construction where prolonged contact will degrade the aluminum.
2. All ells used in rigid aluminum conduit systems shall be rigid galvanized steel.
3. Manufactured in conformance with UL standards.
4. Comply with ANSI C80.5 and UL 6A.

G. FLEXIBLE METAL CONDUIT

1. Flexible metal conduit may be used only where required for connection to light fixtures, motors, and other equipment subject to vibration. It shall be constructed of steel. It shall be installed with connectors designed for the purpose. All flexible metal conduit shall be installed as a single piece. No joints shall be installed. Flexible conduit shall not be used in wet or dusty locations or where exposed to oil, water, or other damaging environments. An equipment grounding conductor or bonding jumper shall be used at all flexible conduit installations. Flexible metal conduit shall not be used in lengths over six feet for light fixture and three feet for other connections. Flexible metal conduit shall not be used in telephone, fire alarm, intercom, security, and other communication systems.
2. Comply with UL 1.

H. LIQUIDTIGHT FLEXIBLE METAL CONDUIT

1. Weatherproof flexible metal conduit shall be wound from a single strip of steel, neoprene covered, equivalent to "Liquatite" or "Sealtite" Type "UA". It shall be installed in such a manner that it will not tend to pull away from the connectors. Provide strain relief fittings equivalent to "Kellems" as required where subject to vibration. Flexible connections to motors in dusty areas shall be dust-tight, in areas exposed to the weather - weatherproof. Length shall not exceed 3' unless permitted by the Engineer.
2. Comply with UL 360.

I. RIGID NON-METALLIC CONDUIT

1. Polyvinylchloride (PVC) Conduit:

   a. PVC conduit shall be Type II, in conformance with NEMA TC2 and the following:

      1) Schedule 40 and 80, high impact.
      2) Suitable for use with 90ºC rated wire.
      3) Conform to UL Standard 65l and carry appropriate UL listing for above and below ground use.

2. Rigid non-metallic conduit shall be constructed of PVC, nominally schedule 40 weight. If installation will enclose utility company provided conductors, verify exact type required and install in accordance with their standards, where more stringent than this specification in normal building conditions.
3. Rigid non-metallic conduit may be used in exterior wet or damp locations where installed under slab or underground. It shall not be run in interior locations, except with special permission from the Engineer for use in corrosive environments, and then only if protected from physical damage. No rigid non-metallic conduit may be installed in environmental air plenums or cast into above-grade concrete slabs. No rigid nonmetallic conduit may be installed in locations where the ambient temperature might exceed the rating of the raceway.
4. Where rigid non-metallic conduit is placed underground, as for feeder circuits, secondaries or branch circuit runs and where ell is made upward thru a slab on grade, transition the turning ell and the riser to rigid steel conduit to a height of 6" above the concrete slab.
5. Flexible non-metallic conduit shall not be used, except by special permission, obtained in writing from the Engineer.
6. Provide equipment grounding conductors of copper, sized as required by codes, in all circuits installed in rigid nonmetallic raceways.
7. Manufactured in conformance with UL standards.

J. RACEWAY FITTINGS

1. Fixture whips shall be 1/2" flexible, with clamp-on steel fittings at each end, six foot maximum length, with insulated throat bushings at each end and bonding locknuts. Wiring thru fixture whips shall be #12 AWG, with #12 AWG ground bonded to outlet at source end.
2. Raceway fittings (or condulets) shall be of gray iron, malleable iron, or heavy copper-free cast aluminum. They shall be furnished in proper configurations, avoiding excessive plugged openings. Any openings that are left shall be properly plugged. All coverplates shall be gasketed with neoprene or similar approved materials, rated for the environment. Wiring splices within are not permitted.
3. Where required, raceway fittings shall be provided in explosion-proof configurations rated for the atmosphere. Place conduit seal off fittings at each device in accord with applicable codes. Seal off fittings shall be packed with wadding and poured with an approved non-shrink sealing compound.
4. Where conduit transitions in a run from a cold to a warm environment, (such as at a freezer, refrigerator, or exterior wall) seal off fittings shall be placed on the warm side

immediately at the boundary to prevent migration of condensation within raceway systems.

5. Conduit bodies, junction boxes and fittings shall be dust tight and threaded for dusty areas, weatherproof for exterior locations and vapor tight for damp areas. Conduit fittings shall be as manufactured by Crouse Hinds, Appleton, Killark or approved equivalent. All surface mounted conduit fittings as with "FS", "FD", "GUB" Types etc., shall be provided with mounting hubs.
6. Where lighting fixtures, appliances or wiring devices are to be suspended from ceiling outlet boxes, they shall be provided with 3/4" rigid conduit pendants. Outlet boxes shall be malleable iron, provided with self-aligning covers with swivel ball joint and #14-gauge steel locking ring. Provide safety chain between building structure and ballast housing of light fixtures for all fixtures, appliances, or devices greater than 10 lbs. weight. Fixtures shall be installed plumb and level. Cover pendants shall be finished to match fixtures.
7. UL listed expansion/deflection fitting shall be provided at all locations where a raceway/conduit crosses a structural joint intended for expansion, contraction, or deflection. Other approved means may be acceptable with permission of the Engineer. Provide copper ground bonding jumpers across expansion fittings.
8. Fittings for threaded raceways shall be tapered thread with all burrs removed, reamed ends and cutting oil wiped clean.
9. Fittings for EMT conduits 2-1/2" and smaller shall be of steel, compression type. Fittings for sizes larger than 2-1/2" shall be setscrew, with two setscrews each side. Conduit stops shall be formed in center of couplings. All EMT connectors and couplings shall be of formed steel construction. All connectors shall be insulated throat type.
10. Indentation or die-cast fittings shall not be permitted in any raceway system.
11. Compression type fittings shall be utilized for EMT conduit installed in damp or dusty locations, or where otherwise indicated.
12. All conduit fittings shall be securely tightened. All threaded fittings shall engage seven full threads. Fasteners shall be properly torqued to manufacturer's recommendations.
13. Comply with NEMA FB1 and UL 514B.

2.2 SURFACE MOUNTED METAL RACEWAY

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Wiremold
2. Istrol
3. Hubbell

B. Surface metal raceways shall only be provided where indicated on the drawings.

C. System: Provide surface raceway systems for branch circuit and data network voice, video and ot

D. her low-voltage wiring. Surface raceway system shall consist of raceway bases, covers, pre-divided raceway bases, dual covers, appropriate fittings, and device mounting plates necessary for a complete installation.

E. Surface metal raceways shall be constructed of code gauge corrosion-resistant galvanized steel or aluminum extrusions, and finished in an ivory, buff or grey color as selected by the Architect. Finishes shall be suitable for field painting, prepared by the installing Contractor as necessary.

F. Surface metal raceways, where used as raceways only, shall be sized for the conductors indicated. Nominal minimum size of such raceways shall be equivalent to Wiremold Co. Series #700, or equivalent by Walkerduct, Isotrol or other approved manufacturer.

G. Surface metal raceways to be furnished with integral receptacles shall have Simplex Nema 5-20R outlets spaced on centers as indicated on plans. These shall be Wiremold Co. #2200 Series or equivalent Walkerduct, Isotrol or other approved manufacturer.

H. Surface Mounted Aluminum Raceways: ALDS4000 Dual Channel Aluminum Surface Raceway by The Wiremold Company.

1. Material: Alloy 6063-T5 extruded aluminum; minimum thickness 0.050-inches.
2. Finish: Satin, No. 204 clear anodized, 0.004-inch thick, Class R1 Mil-Spec.
3. Device Cover Plates: Suitable to mount commercially available duplex devices, single 1.40" and 1.59" diameter receptacles. GFCI, surge receptacles and other rectangular faced devices, and voice and data jacks. Cover plates shall be removable using standard screwdriver without marring the finish.

I. Surface metal raceways and all components and fittings shall be furnished by a single manufacturer, wherever practical. All trim and cover fittings, flush feed boxes, splices, outlet fittings, etc., necessary for a complete installation shall be provided by the installing contractor. These raceways shall be rigidly mounted with approved fasteners on not to exceed 24" centers in a run, or 6" from ends and on either side of a corner. Refer to plans for notations on exact types of these raceways and outlet configurations.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company.
3. Mono-Systems, Inc.
4. Square D; a brand of Schneider Electric.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireways of painted steel construction shall be corrosion-resistant, moisture and oil resistant where indicated or necessary. Wireways shall be furnished in nominal sizes of 2 ½ " X 2 ½ ", 4" X 4", 6"" X 6", 8" X 8" or 12" X 12", as indicated on plans. Furnish with hinged covers on all runs and removable covers on all fittings, to allow a continuous unobstructed path for conductor installation. Provide knockouts on all runs, unless otherwise indicated or prohibited by codes.

E. Provide wireways with hangers of same manufacturer, installed so as to allow unobstructed access to wireway interior. Install at not to exceed 8'-0" centers, closer as needed at fittings and turns. Use ¼ " rod hangers minimum for up to 4"X 4", 3/8 " rod minimum up to 8"X 8", ½ " rod minimum for 12" X 12".

F. Wireway Covers: Furnish with continuous hinged covers on all runs and removable covers on all fittings, to allow a continuous unobstructed path for conductor installation.

G. Finish: Manufacturer's standard enamel finish.

2.4 DUCT BANKS

A. Duct banks are defined as a raceway or raceways installed in underground locations, enclosed in a steel-reinforced concrete envelope. They shall be installed where indicated on the drawings or otherwise required.

B. All concrete used in duct bank construction shall be 3000 PSI minimum 28-day compressive strength unless otherwise noted, in accordance with latest A.C.I. standards. Testing of concrete shall be the responsibility of the Contractor, as directed by the engineer. Place concrete against undisturbed earth or provide forming as needed.

C. Duct bank raceways shall receive a minimum of 3" concrete cover all sides. Minimum size of any duct bank shall be 12" x 12" square, in cross section. In all cases, local and national codes shall apply to duct bank construction where they exceed the requirements of this specification.

D. Each corner of duct bank shall receive a minimum No. 4 steel reinforcing bar with 2" minimum concrete cover on all sides. Lap bars fifteen diameters at all splices. Reinforcing steel shall be rigidly supported during pour and vibration and shall be constructed to ASTM standards.

E. Support for encased raceways shall be as recommended by raceway manufacturer, spaced 8'-0" maximum on centers, rigidly fastened to prevent floating of ducts during concrete pours. Supports shall be of a material compatible with the raceway, and shall be of the interlocking type, forming a rigidly braced installation. Provide base type and intermediate type spacers to suit conduit configurations and sizes.

F. Where rigid nonmetallic raceways leave concrete duct banks, a transition to rigid steel conduit shall be made 18" inside the concrete envelope. Under no circumstances shall PVC, EB or similar ducts exit concrete envelope, except where duct bank ties into a manhole wall. Provide bell ends at such terminations and towel duct bank rebars 4" into manhole wall with grout. Refer to details on drawings, as applicable. Slope all raceways within duct bank systems such that they shall drain into manholes or pull boxes. Provide proper drainage at manholes or pull boxes to prevent water accumulation.

G. Where ducts transition thru manholes, pull boxes or at terminating end, each duct shall be specifically identified. A nomenclature as shown on the drawings or as agreed upon by the installer and engineer shall be utilized to identify each individual duct. A permanent means of identifying each duct, such as engraved lamacoid plates or stamped metal tags shall be used.

2.5 SUPPORTS AND HANGERS

A. Coordinate installation of Supports and Hangers with Division 26 Section "Hangers and Supports for Electrical Systems."

B. Supports and hangers shall be installed in accord with all applicable codes and standards. They shall be corrosion - resistant, galvanized or furnished with an equivalent protective coating. All electrical raceways shall be hung independently from the building structure with UL listed and approved materials. Hangers and supports depending from the support systems of other trades work shall not be permitted, except with specific approval in writing from the Engineer. The use of tie wire for support or fastening of any raceway system is prohibited. Perforated metal tape shall not be used for raceway support.

C. No raceway shall be installed on acoustic tile ceiling tees, or in any location that will impair the functioning, access or code-required clearances for any equipment or system.

D. Supports for raceways shall be of materials compatible with the raceway, of malleable iron, spring steel, stamped steel or other approved material. Die-cast fittings are not permitted for supports.

E. The installing contractor shall provide all necessary supports and braces for raceways, in a rigid and safe installation, complying with all applicable codes.

F. Individual conduits routed on building walls or equipment shall be secured by two- hole galvanized malleable iron or stamped steel pipe strap or "minerallac" 2-piece straps. The straps are to be anchored by an approved means such as expansion anchors, toggle bolts, through bolts, etc. Where required by codes or other standards, provide spacers behind mounting clamps to space conduits off walls.

G. Supports may not be fastened to roof decking on drive pins.

H. Individual conduits run on building steel shall be secured by means of clamp supports similar and equal to those manufactured by the C.C. Korn Company, Elcen Co., B-Line, or approved equivalent. Provide korn clamps, bulb-tee, flange clamps, beam clamps, "minerallacs", etc.

I. Where feasible, vertical and/or horizontal runs of conduit shall be grouped in common hangers on "trapezes" of channel stock as manufactured by "Unistrut" or equivalent, 1-5/8" minimum depth. Utilize conduit clamps appropriate to the channel.

J. Channel strut systems for supporting electrical equipment or raceways shall be constructed of 16 gauge minimum hot dip galvanized steel with 9/16" diameter holes on 8" centers, with finish coat of paint as manufactured by Unistrut, B-Line, Kindorf, or approved equivalent.

K. The minimum diameter of round all-thread steel rods used for hangers and supports shall be 1/4", 20 threads per inch. All-thread rod shall be furnished with a corrosion-resistant finish.

L. Welding directly on conduit or fittings is not permitted.

M. Provide riser support clamps for vertical conduit runs. Riser support clamps shall be of heavy gauge steel construction. Install riser support clamps at each floor level penetration, or as otherwise required.

N. Provide conduit cable support clamps for vertical conductor runs as required or indicated on plans. Clamps to be insulating wedging plug, with malleable iron support ring. Install within properly sized and anchored junction box.

O. Spring steel clips and fittings such as those manufactured by HITT-Thomas, Caddy-Erico, or approved equivalent, with black oxide finish are permitted in any indoor dry location for concealed work, where acceptable to the local authority having jurisdiction.

P. Raceways shall be securely and rigidly fastened in place at intervals specified here-in-before with wall brackets, conduit clamps, approved conduit hangers, or beam clamps. Fastenings shall be made by wood screws or screw type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick; by machine screws, welded threaded studs, heat treated or spring steel tension clamps on steel work. Bolts, screws, etc. used in securing the work shall be galvanized and of ample size for the service. Assembly bolts, nuts, washers, etc., shall be zinc or cadmium coated. Raceways shall not be welded to steel structures. Holes cut to a depth of more than 1-1/2 inches in reinforced concrete beams or to a depth of more than 3/4 inch in concrete joists shall avoid cutting the main reinforcing bars.

Q. The use of perforated iron straps or wire for supporting conduits will not be permitted.

R. Where conduits are installed in groups on a common steel channel type support, each conduit shall be secured by Korns, Unistrut, Kindorf clamps or equal.

S. Rigid conduits, where they enter panelboards, cabinets or pull boxes shall be secured in place by galvanized, double locknuts (one inside and one outside) and non-metallic bushings. All bushings shall have insulated material which has been permanently fastened to the fittings. Bushings for conduit 1-1/2 inches trade size and larger, which are used for power distribution, shall be complete with grounding lug and shall be bonded to the box by means of bare copper wire.

2.6 FIRESTOPPING MATERIALS

A. All conduits and cables penetrating fire rated floors, walls and ceilings shall be firestopped. Firestopping assembly must be UL listed. All corridor walls, storage room walls and mechanical room walls are to be considered minimum one-hour fire rated. The Level 02, Level 03 and Penthouse floor slabs shall also be considered minimum one-hour rated. Refer to Architectural drawings for additional rating requirements.

B. Provide shop drawings indicating penetration detail for each type of wall and floor construction. Shop drawings must be specific for each individual type. (i.e., one-hour fire rated gypsum wall board with insulated metal pipe penetration.)

C. 3M fire protection products are listed below. Equivalent products may be submitted if they are UL listed.

D. The manufacturer of the firestopping materials must provide on-site training for the contractor. The training session shall demonstrate to the contractors the proper installation techniques for all the firestopping materials. The training session shall be four hours minimum. Contact the Engineer prior to conducting this training session.

E. Firestopping materials to include but not limed to the following:

1. 3M fire barrier FS-195 wrap/strip.
2. 3M fire barrier CP 25 caulk.
3. 3M fire barrier MP moldable putty.
4. 3M fire barrier RC-1 restricting collar with steel hose clamp.
5. 3M fire barrier damming materials.
6. 3M fire barrier CS-195 composite sheet.
7. 3M fire barrier fire dam 150 caulk.
8. Steel sleeves.

2.7 SPECIALTIES

A. All EMT terminations at junction boxes, panels, etc. shall be made with case hardened locknuts and appropriate fittings, with insulated throat liners. Insulating terminations shall be manufactured as a single unit. The use of split sleeve insulators is not permitted.

B. All rigid conduit, except main and branch feeders, shall have heavy fiber insulating bushings reinforced with double locknuts. All branch and main feeders shall have insulated bushings with grounding lugs and shall be bonded to enclosures with appropriately sized copper jumpers, except at pad mounted transformers. Bonding jumpers shall be installed as required by the NEC and other applicable codes.

C. All conduit stubbed through floor during construction shall have openings protected with plastic caps approved for this purpose. Connections on both ends of all flexible conduit shall be equivalent to Thomas and Betts, Ideal, Appleton, Efcor, or approved equivalent, rated for the environment.

D. Nylon pull strings shall be provided in all empty conduit and in all conduit installed for other trades. Pull strings shall be left securely tied off at each end.

E. Where spare raceways terminate in switchboards or motor control centers a fish tape barrier shall be provided.

F. All outlet, junction and pull boxes shall be grounded with pigtail to the equipment grounding conductor.

G. All fire alarm raceways in concealed areas, data/mechanical/electrical rooms and above ceilings shall be red. Exposed fire alarm raceways shall match adjacent finishes.

H. All junction, outlet and pull boxes in data/mechanical/electrical rooms and above ceilings shall be identified with panel and circuit designation on outside of covers. All junction, outlet and pull boxes in exposed areas shall be identified with panel and circuit designation on inside of covers.

2.8 COMMUNICATIONS (DATA/VOICE) OUTLETS

A. Outlet boxes shall be 5” square by 2-7/8” deep with single or double gang with raised extension ring.

B. All communications outlets shall be fed with at least (1) 1-1/4” inch EMT conduits, with an absolute minimum number of bends from the outlet to the cable tray, wire way or homerun directly to the Telecommunications room. Pull boxes must be installed after every 270 degrees of bend (including offsets) or 100 feet of the conduit run.

C. When mounting the outlet box in a steel studded wall, use a back brace.

D. Use only compression fittings at joints. No more than one offset in a conduit run unless additional pull boxes are provided after each offset.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC
2. Concealed Conduit, Aboveground: GRC
3. Underslab Conduit: Concrete encased RNC

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Concealed in Ceilings and Interior Walls and Partitions: EMT, IMC or GRC
2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC
3. Damp or Wet Locations: GRC
4. Exposed, Not Subject to Physical Damage: GRC, IMC or EMT. Raceway locations include the following:

    a. Electrical Rooms

5. Exposed and Subject to Severe Physical Damage: GRC or IMC. Raceway locations include the following:

    a. Mechanical rooms (below 8’-0”).
    b. Gymnasiums.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

D. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.

G. PVC conduit and plastic molding are not acceptable except in caustic environments.

H. Aluminum is not acceptable in caustic environments.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems" for hangers and supports.

C. Horizontal runs of conduit between outlet boxes in walls shall not be permitted.

D. This Contractor shall lay-out and install all conduit systems so as to avoid any other service or systems, the proximity of which may prove injurious to the conduit, or conductors which it confines. All conduit systems, except those otherwise specifically shown to the contrary, shall

be concealed in the building construction or run above ceilings. Size of all conduit shall conform to Annex C, of the National Electrical Code, unless otherwise shown on the Contract Drawings.

E. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

F. Support conduit within 12 inches of enclosures to which attached.

G. No conduit shall be installed in or below poured concrete slabs except with permission of the architect or engineer. Conduit shall be held at least 12" from flues, steam, or hot water pipes.

H. All conduits in slab, under slab and in areas subject to abuse shall be galvanized rigid steel with threaded fittings or rigid PVC Conduit encased in 3" (minimum) and steel reinforced concrete with dye identification.

I. Intermediate grade conduit will not be acceptable in place of galvanized rigid steel conduit.

J. All exposed conduit shall be installed with runs parallel or perpendicular to walls, structural members or intersections of vertical planes and ceilings, with right angle turns consisting of cast metal fittings or symmetrical bends unless otherwise shown. All conduit shall have supports spaced not more than eight feet apart. Randomly routed conduits will not be acceptable.

K. Conduit shall be installed in such a manner so as to insure against collection of trapped condensation. All runs of conduit shall be arranged so as to be devoid of traps. Trapped conduit runs shall be provided with explosion proof drains at low points. Runs of conduit between junctions shall not have more than the equivalent of three 90° bends.

L. Junction boxes shall be installed so that conduit runs will not exceed 50', or as shown on the Contract Drawings. Junction boxes shall be sized per NEC, Article 370.

M. Install electrical raceways in accordance with manufacturer's written instructions, applicable requirements of latest edition of the NEC, and NECA "Standard of Installation", complying with recognized industry practices.

N. Coordinate with other trades, including metal and concrete deck trades, as necessary to interface installation of electrical raceways and components.

O. Level and square raceway runs and install at proper elevations and required heights. Hold tight to structure wherever possible, to maximize available space and not restrict other trades.

P. Complete installation of electrical raceways before starting installation of cables or wires within raceways.

Q. Bushings shall be provided on conduits to protect cables transitioning from conduits to cable tray pathway.

R. Provide plastic bushings on the end of all conduit stub-ups.

S. Install electrical raceways in accordance with manufacturer's written instructions, applicable requirements of latest edition of the NEC, and NECA "Standard of Installation", complying with recognized industry practices.

T. Coordinate with other trades, including metal and concrete deck trades, as necessary to interface installation of electrical raceways and components.

U. Level and square raceway runs and install at proper elevations and required heights. Hold tight to structure wherever possible, to maximize available space and not restrict other trades.

V. Raceways installed in exterior locations shall receive one coat of primer, two coats finish paint after preparation of galvanizing, color selected by Architect. Exposed raceways in painted interior areas shall be similarly painted.

W. Conduits, cables, raceways, and enclosures under metal-corrugated sheet roof decking shall not be located within 1-1/2” of the roof decking, measured from the lowest surface of the roof

decking to the top of the conduit, cable, raceway, or box. GRS is acceptable to route tight to bottom of roof deck.

X. Conduits, cables, raceways, and enclosures are not permitted in concealed locations of metal-corrugated sheet decking type roofing.

Y. All conduit, tubing, raceways, ducts, and duct banks shall be installed in such manner as to insure against collection of trapped condensation and raceway runs shall be arranged so as to be devoid of traps.

Z. Where conduits pass through exterior concrete walls of facilities, the entrance shall be made watertight. This shall be done by providing pipe sleeves in the concrete with l/2" minimum entrance seal.

AA. All necessary precautions to prevent the lodgment of dirt, plaster, or trash in all conduit or tubing, fittings and boxes during construction shall be taken. All conduit in floors, concrete or below grade shall be swabbed free of debris or moisture before wires are pulled.

BB. Liquid-tight flexible steel conduit shall be used for connections to all vibrating equipment, including motors and transformers, with a minimum of 18-inches of flex looped to avoid restraining equipment vibrating.

CC. Stub-ups to Above Recessed Ceilings:

1. Use EMT for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

DD. Grounding bushings and bonding jumpers shall be used on conduit terminations at all junction boxes, pull boxes and cabinets to maintain grounding integrity of conduit system.

EE. Do not install conduits or raceways on exterior facades or within wall cavities.

FF. All conduit and PVC conduits installed below grade or below slabs (where indicated) shall be concrete encased.

GG. Do not drill into bar joists to support raceways or cables.

HH. All utilities and underground conduits shall be surveyed and recorded on as-built drawings.

II. All exterior conduits and raceways shall be painted.

JJ. All floor slabs and concrete walls shall be x-rayed before cutting.

KK. Contractor must maintain a minimum 12” clear space above, 6” below and a minimum 26” clear on one side of all cable trays and wireways (both new and existing).

LL. Absolutely no “LB’s” are allowed in any communications conduit installation.

MM. Conduit ends at a wireway will be mechanically fastened, have plastic bushings, and be wire bonded to the wireway.

NN. Underground electric, cable TV, telephone service or other rigid steel conduit and underfloor rigid steel conduit below the concrete floor slab shall be painted with two coats of bitumastic paint, such as "Asphaltum".

OO. All underground or underfloor conduits shall be swabbed free of all moisture and debris before conductors are pulled.

PP. At least two (2) 1” and three (3) 3/4” conduits shall be stubbed from flush-mounted panelboards into the nearest accessible area for future use. Provide suitable closures for these stubs. Identify each stub with a suitable hang tag.

QQ. Coordinate with other trades, including metal and concrete deck trades, as necessary to interface installation of electrical raceways and components.

RR. All underground conduits shall be buried to minimum depth of 24" from the top of the concrete encasement or raceway to finished grade, unless otherwise noted on plans. Observe minimum burial requirements of local utility company where their standards or regulations apply. Conduits containing primary power conductors, (higher than 600 volts to ground) shall be 48" to top below finished grade, unless otherwise noted on plans. Conduits containing secondary power conductors, (600 volts and less to ground) shall be 36" to top below finished grade, unless otherwise noted on plans.

SS. Provide uni-strut racks where multiple conduits are supported at one location.

TT. Provide separate a completely separate raceway system of conduits, pull-boxes, etc. for each emergency power branch and for normal power for complete separation per NEC.

UU. Where existing panels are flush mounted in walls, contractor shall cut, patch, and repair existing construction as required for concealed conduit entry for new connections to those panels.

VV. Expansion-Joint Fittings:

1. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
2. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

3.3 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

3.4 SPECIALTIES

A. All EMT terminations at junction boxes, panels, etc. shall be made with case hardened locknuts and appropriate fittings, with insulated throat liners. Insulating terminations shall be manufactured as a single unit. The use of split sleeve insulators is not permitted.

B. All rigid conduit, except main and branch feeders, shall have heavy fiber insulating bushings reinforced with double locknuts. All branch and main feeders shall have insulated bushings with grounding lugs and shall be bonded to enclosures with appropriately sized copper jumpers, except at pad mounted transformers. Bonding jumpers shall be installed as required by the NEC and other applicable codes.

C. All conduit stubbed through floor during construction shall have openings protected with plastic caps approved for this purpose. Connections on both ends of all flexible conduit shall be equivalent to Thomas and Betts, Ideal, Appleton, Efcor, or approved equivalent, rated for the environment.

D. Pulling lines shall be left in all open conduit systems and shall be non-metallic, left securely tied off at each end cap any unused conduits.

E. Where spare raceways terminate in switchboards or motor control centers a fishtape barrier shall be provided.

F. All metal boxes, junction boxes and pull boxes shall be grounded with pigtails to the equipment grounding conductor.

G. All empty raceways inside switchgear and open spaces shall be capped.

H. All fire alarm raceways shall be red. Painted red conduit will not be accepted. Junction and pull boxes shall be identified with panel and circuit number on covers.

END OF SECTION 260533

SECTION 260535 - CABINETS, OUTLET BOXES AND PULL BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section Includes: Boxes, enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 CABINETS, OUTLETS AND PULL BOXES

A. Cabinets for lighting and power, telephone, pull boxes, outlet boxes, or any other purposes specified or shown on the Contract Drawings, shall be constructed of code gauge, galvanized steel with sides formed and corner seams riveted or welded before galvanizing. Boxes assembled with sheet metal screws will not be accepted. Pull boxes shall include all boxes used to reduce the run of conduit to the required number of feet or bends, supports, taps, troughs, and similar applications and shall also be constructed as specified above.

B. All cabinets and boxes for NEMA 1 and 1A application shall be provided with knockouts, as necessary, or shall be cut in the field by approved cutting tools which will provide a clean, symmetrically cut opening. All boxes, except panelboards, shall be provided with code gauge fronts with hex head or pan head screw fasteners. Fronts for panelboards shall be as specified for panelboards.

C. Ceiling outlet boxes shall be galvanized steel, 4" octagonal, not less than 2 1/8" deep, with lugs or ears to secure covers, and those for use with ceiling lighting fixtures shall be fitted with 3/8" fixture studs fastened to the back of the boxes, where applicable. Provide adequate support with at least a 2 x safety factor for the anticipated fixture weight.

D. Special size concealed outlet boxes for clocks, speakers, alarms, TV, etc., shall be provided by the manufacturer of the equipment.

E. The location of outlets, as shown on the drawings, shall be considered as approximate only. It shall be incumbent upon this Contractor to study the general building drawings, with relation to spaces surrounding each outlet, in order to make his work fit the work of others and in order that when the devices or fixtures are installed, they will be symmetrically located and will not interfere with any other work or equipment. Any change in fixture or layout shall be coordinated with and approved by the Engineer before this change is made. Regardless of the orientation shown on the drawings, all devices shall be easily accessible when installed.

F. All outlets, pull boxes, junction boxes, cabinets, etc., shall be sized per the current edition of the National Electrical Code.

G. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

H. Outlet boxes and junction or pull boxes shall be threaded for rigid-threaded conduit, dust-tight vapor-tight or weatherproof as required for areas other than for NEMA 1 or 1A application. These shall be as manufactured by Crouse-Hinds, Appleton, Killark, or approved as equivalent.

I. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

J. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.

K. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

L. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.

1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

M. NEMA 1 or 1A outlet boxes or pull or junction boxes shall be as manufactured by Appleton, Steel City, T & B, or approved equivalent.

1. Outlet boxes for switches, receptacles, etc., concealed in walls shall be galvanized steel, 4” x 4” x 2 1/8” deep with plaster cover for the number of devices as required and to be flush with finished wall. Where outlet boxes are installed in walls of glazed tile, brick, concrete block, or other masonry which will not be covered with plaster or in walls covered by wood wainscot or paneling, deep sectional masonry boxes shall be used, and they shall be completely covered with the plates or lighting fixtures. This Contractor shall cooperate with the brick layers, block layers and carpenters to ensure that the outlet boxes are installed straight and snugly in the walls. Receptacles shall be set vertically in walls.

N. Unless otherwise noted on the drawings or in the specifications, outlet boxes shall be installed at the following heights to centerline of box:

Wall Switches, Control Stations	3'-10"
Convenience Outlets	1'-6"
Above Counter Convenience Outlets	Bottom at 2" above top of backsplash
TV Outlets	1'-6"
TV Outlets - At Wall Brackets	7'-2"
Desk Telephones	1'-6"
Wall-Mounted Telephone	4'-6"
Weatherproof Outlets	2'-2"
Disconnects, Branch Panelboards	5'-0" max. to centerline
Fire Alarm Manual Stations	3'-10"
Fire Alarm Audio and/or Visual Unit…80" AFF to bottom of device or 6" below ceiling, whichever is lower	

Note: Contractor is to refer to Architectural elevations and coordinate device mounting heights, quantities, and locations.

O. Outlet boxes mounted in glazed tile, brick, concrete block, or other types of masonry walls shall be mounted above or below the mortar joint. Do Not Split The Mortar Joint.

P. Boxes for more than two (2) devices shall be for number of devices required and shall be one piece. No ganging of single switch boxes will be allowed.

Q. Outlets provided shall have only the holes necessary to accommodate the conduit at the point of insulation and shall be rigidly secure in position. Boxes with knockout removed and openings not used shall be replaced or provided with a listed knockout closure.

R. Exterior outlets shall be die-cast aluminum, weather-proof with gasketed covers and baked on grey enamel finish, per ANSI 61.

S. Boxes up to 4-11/16 square size shall be fastened to their mounting surface with two fasteners of proper size. Larger sizes shall be fastened with four fasteners, minimum.

T. Openings for conduit entrance in cabinets and boxes shall be prefabricated, punched, drilled and/or reamed. The use of a cutting torch for this purpose is prohibited.

U. Aluminum is not acceptable in caustic environments.

2.2 DATA/VOICE OUTLETS

A. Outlet boxes shall be 5” square by 2-7/8” deep with single or double gang with raised extension ring.

B. All communications outlets shall be fed with at least (1) 1-1/4” inch EMT conduits, with an absolute minimum amount of bends from the outlet to the cable tray, wire way or homerun directly to the Telecommunications room. Pull boxes must be installed after every 270 degrees of bend (including offsets) or 100 feet of the conduit run.

C. When mounting the outlet box in a steel studded wall, use a back brace.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

C. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

D. Install electrical boxes as required for splices, taps, wire pulling, equipment connections.

E. Do not install flush mounting boxes back-to-back in walls; install with minimum 6-inches separation. Install with 24-inches separation in acoustic rated walls.

F. Do not fasten boxes to ceiling support wires or other piping systems.

G. Support all boxes independently of conduit.

H. Grounding bushings and bonding jumpers shall be used on conduit terminations at all junction boxes, pull boxes and cabinets to maintain grounding integrity of conduit system.

3.2 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260535

SECTION 260553 - IDENTIFICATIONS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 FLOOR MARKING TAPE

A. 2-inch wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.2 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches.

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES”

F. Provide warning signs for the enclosures of electrical equipment including pad-mounted transformers, pad-mounted switches, and switchgear having a nominal rating exceeding 600 volts.

1. When the enclosure integrity of such equipment is specified to be in accordance with IEEE C57.12.28 or IEEE C57.12.29, such as for pad-mounted transformers, provide self-adhesive warning signs on the outside of the high voltage compartment door(s). Sign shall be a decal and shall have nominal dimensions of 7 by 10 inches with the legend "DANGER HIGH VOLTAGE" printed in two lines of nominal 2-inch-high letters. The word "DANGER" shall be in white letters on a red background and the words "HIGH VOLTAGE" shall be in black letters on a white background. Decal shall be Panduit No. PPSO710D72 or approved equal.
2. When such equipment is guarded by a fence, mount signs on the fence. Provide metal signs having nominal dimensions of 14 by 10 inches with the legend "DANGER HIGH VOLTAGE KEEP OUT" printed in three lines of nominal 3-inch-high white letters on a red and black field. Sign shall be Panduit No. PASO710D72 or approved equal.

2.3 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16-inch-thick for signs up to 20 sq. inches and 1/8-inch-thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.4 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

B. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

C. Retain paragraph below to specify type of label for identifying outdoor equipment if specified in "Identification Schedule" Article.

D. Stenciled Legend: In non-fading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.5 CABLE TIES

A. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Clear

B. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Clear

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws, or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Cable Ties: For attaching tags.

1. Indoors: Plenum rated.
2. Outdoors: UV-stabilized nylon.

G. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

H. Equipment, disconnect switches, switchboards, panelboards, transformers, motor starters, variable frequency drives, special device plates, and similar materials shall be clearly marked as to their function and use. Markings shall be applied neatly and conspicuously to the front of each item of equipment with 1/2" black lamacoid plate (or equivalent) with white letters 1/4" high unless otherwise specified.

I. All receptacle cover plates shall be marked with their panel and circuit number with clear, machine, printed adhesive labels. Circuit number shall also be hand written inside outlet box with black permanent marker.

J. The Contractor shall provide clearly legible typewritten directories in each electrical panel indicating the area, item of equipment, etc. controlled by each switch, breaker, fuse, etc. These directories are to be inserted into plastic cardholders on back door in each panel. Provide electronic Excel files of all directories to owner as part of Close-out Documentation. Any existing panels which are affected by this contractor's work shall also be provided with new directories. Descriptions to be approved by the Owner.

1. EXAMPLE:

    a. LIGHTS, ROOM 100
    b. RECEPTION, ROOM 200

K. Electrical distribution equipment, including branch circuit panelboards switchboards, shall be provided with a black lamacoid plastic plate with 1/2" white letters for panel designation and 1/4" white letters showing voltage and feeder information. Branch circuit switches shall be designated as to function. Electrical distribution equipment labels shall indicate the source they are fed from, and the circuit number at that source. Clearly indicate the exact label legend to be furnished with each panelboard and switchgear on the shop drawings for each item of equipment prior to submission of shop drawings. Refer to drawings for further details.

L. Lamacoid plates shall be located at center of top of trim for branch circuit panels, switchboard, and centered at side for branch circuit switches. Fasten with self-tapping stainless steel screws or other approved method.

M. Verify identity of each item before installing identification products

N. All junction boxes utilized for fire alarm circuits, connections, devices, etc. shall have the cover painted red.

O. All device cover plates which are not engraved shall have clear adhesive labels with panel and circuit number type-written in black lettering.

P. All systems requiring room names and/or numbers for labeling or programming shall use the Owner's actual room name and numbering scheme, not floor plans. All reprogramming shall be included as required to accommodate construction phasing.

Q. All junction, outlet and pull boxes in data/mechanical/electrical rooms and above ceilings shall be identified with panel and circuit designation on outside of covers. All junction, outlet and pull boxes in exposed areas shall be identified with panel and circuit designation on inside of covers.

R. The inside of all junctions and backboxes shall be marked with panel and circuit number in permanent marker.

S. All identifications shall be consistent with the owner's standard practices, especially within existing facilities. Where the requirements here-in are in conflict with such standard practices, the contractor shall notify the engineer in writing prior to ordering any material for clarification.

T. Identification shall consist of all UPPER-CASE LETTERS.

U. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

V. Apply identification devices to surfaces that require finish after completing finish work.

W. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification devices.

X. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

Y. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

Z. Fire alarm system: Install a nameplate on the fire alarm panel to indicate the panelboard and circuit number supplying the fire alarm system.

AA. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.

BB. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

CC. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

DD. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

EE. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

FF. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

GG. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch high letters for emergency instructions at equipment used for power transfer and load shedding.

HH. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

II. Labeling Instructions:

1. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.
2. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
3. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
4. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 260553

SECTION 260573 - ELECTRICAL STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Provide a short-circuit, component protection, arc-flash hazard analysis, and protective device coordination study for the electrical distribution system beginning with all power sources and ending with the lowest level power, lighting and receptacle panels, and motor control equipment.

B. This Section includes computer-based, fault-current, arc-flash and overcurrent protective device coordination studies. Hand calculations are not acceptable. Protective devices shall be set based on results of the protective device coordination study.

C. Electrical Studies shall be performed by the Low-Voltage Switchboard manufacturer. All Electrical Studies required by this specification shall be completed within five (5) weeks from award of project. The Electrical Contractor shall provide all required data to Low-Voltage Switchboard manufacturer within one (1) week and the manufacturer will have four (4) weeks to complete the studies.

D. A licensed professional engineer employee of the Low-Voltage Switchboard manufacturer shall provide electrical power system studies for the project using the latest version of one of the approved software packages. The software model files shall be submitted with the report. The analysis shall follow the latest IEEE 1584 guidelines.

E. Studies specified herein must be submitted and approved prior to release of any affected equipment. Revisions to equipment or devices necessary to meet study recommendations shall be at the Manufacturer’s expense.

F. All adjustments and settings recommended by these studies shall be made prior to any testing.

G. The analysis shall be submitted to the engineer of record prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing.

1.3 PURPOSE

A. The study shall calculate the worst case available short circuit current at each point in the electrical distribution system considering all power sources under all permissible system operating and switching modes. The study shall be performed in accordance with Part 3 of this specification. The overcurrent protective devices shall have an interrupting and/or withstand rating equal to or greater than the available short circuit current at the applicable time band (1/2, 5, or 8 cycle) at the point of application. Discrepancies shall be noted and called to the attention of the Architect/Engineer.

B. The overcurrent protective devices shall be analyzed for adequate short circuit rating. This analysis shall identify any potential insufficient equipment ratings of existing equipment based on actual available utility values.

C. The study shall also include an arc flash hazard analysis for all electrical equipment. The analysis shall determine the flash protection boundary, incident energy, and required level of Personal Protective Equipment (PPE) for workers at the electrical equipment. The arc flash protection boundary and incident energy shall be determined based upon a working distance as defined in per IEEE 1584, based on system voltages. The electrical distribution equipment shall be field marked with this information in accordance with NFPA 70E.

D. The above study shall use equipment designation (labeling) that is consistent with the electrical system diagrams. Equipment shall be readily identifiable without the use of a cross reference list.

1.4 SUBMITTALS

A. Product Data: Computer software program to be used for studies.

B. Product Certificates: For coordination-study and fault-current-study computer software programs, certifying compliance with IEEE 399.

C. Qualification Data: For coordination-study specialist.

D. Other Action Submittals:

1. The following submittals shall be made after the approval process for system protective devices has been completed. Submittals shall be in digital form.

    a. Coordination-study input data, including completed computer program input data sheets.
    b. Study and Equipment Evaluation Reports.
    c. Coordination-Study Report.
    d. Short Circuit Study and Coordination Study including all input data.
    e. Study recommendations for device settings, fuse types/ sizes and Equipment Evaluation findings.
    f. Report shall include any identified recommendations for improvements or suggestions for correction of deficiencies for consideration by the Architect/Engineer.
    g. Arc-Flash Hazard Calculations and list of data for Labels, including any recommendations to reduce any PPE Category 4 or higher hazard level to a PPE Category 3 or lower hazard level.

2. The results of the study shall be summarized in report form, for review and approval by the Architect/Engineer.
3. The results of all studies shall include the following:

    a. Descriptions, purpose, basis, and scope of study.
    b. Fault current calculations including definition of terms and guide for interpretation of computer printout.
    c. Tabulations of protective device and equipment ratings versus maximum calculated short circuit duties, and commentary regarding same.
    d. Flash hazard analysis report for newly installed and directly impacted existing electrical equipment. Based on the worst case resulting in Greatest Personnel Hazard.
    e. Time versus current curves with tabulations of overcurrent protective device settings and selective coordination analysis and commentary regarding same.
    f. The above studies shall be submitted to the Architect/Engineer for review and comment before any labels are printed.
    g. If power company review and/or approval of device settings or fuse types/sizes is required, appropriate data shall be submitted to the power company for review and/or approval. The results of the power company review and /or approval shall be forwarded to the Architect/Engineer and included in the study report.

E. The studies must bear the signature/seal of the Professional Electrical Engineer in the state where the project is located.

1.5 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.

B. Coordination-Study Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Professional engineer, licensed in the state where Project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.

C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.

D. Comply with IEEE 399 (power system analysis) for general study procedures.

E. Comply with IEEE 1584 (guide for performing arc flash hazard calculations) for Arc Flash calculation procedures.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Computer Software Developers: Subject to compliance with requirements, provide products by SKM Systems Analysis, Inc.

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Comply with IEEE 399.

B. Analytical features of fault-current-study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Discrepancies shall be noted and called to the attention of Architect/Engineer.

3.2 POWER SYSTEM DATA

A. Gather and tabulate the following input data to support coordination study:

1. Product Data for overcurrent protective devices specified in other Division 26 Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Impedance of utility service entrance.
3. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:

a. Circuit-breaker and fuse-current ratings and types.
b. Relays and associated power and current transformer ratings and ratios.
c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
d. Generator kilovolt amperes, size, voltage, and source impedance.
e. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
f. Busway ampacity and impedance.
g. Motor horsepower and code letter designation according to NEMA MG 1.

4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

a. Special load considerations, including starting inrush currents and frequent starting and stopping.
b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
d. Generator thermal-damage curve.
e. Ratings, types, and settings of utility company's overcurrent protective devices.
f. Special overcurrent protective device settings or types stipulated by utility company.
g. Time-current-characteristic curves of devices indicated to be coordinated.
h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical.

B. Data shall be obtained for the power sources (campus 12 kV system and generators), impedance components (transformers, cables, and busway), overcurrent protective devices (fuses, circuit breakers and relays) and other relevant equipment such as automatic transfer switches. Cable data (length, quantity per phase, size, and type) shall be provided by the electrical contractor. Assumptions should only be used when the actual data is not available, and the assumptions should be clearly listed in the report. Assumptions shall be kept to a minimum.

C. A one-line riser diagram shall be provided as part of the analysis and shall clearly identify individual equipment buses, bus numbers used in the analysis, cable information (length, quantity per phase, size, and type), overcurrent device information (manufacturer, type, and size), transformers, motors, transfer switches, generators, etc.

D. The one line and analysis shall use a numbering scheme where each bus begins with a three-digit number followed by a description (e.g., 102 MDPA or 103 ELEV DISC) and each connected circuit breaker or fuse shall have a corresponding designation (e.g., 102-1 MAIN CB, 102-2 ELEVATOR FDR or 103-1 ELEV DISC CB).

3.3 FAULT-CURRENT STUDY

A. Calculate the maximum available short-circuit current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:

1. Switchgear and switchboard bus
2. Medium-voltage switch and transformers

3. Distribution panelboards
4. Branch circuit panelboards
5. Variable Frequency Drives
6. Fused and non-fused disconnects
7. Low-voltage transformers
8. Individual circuit breakers
9. Automatic transfer switches
10. Generator
11. Combination starter/disconnects

B. Study electrical distribution system from normal and alternate emergency power sources throughout electrical distribution system for Project, using approved computer software program. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.

C. Calculate momentary and interrupting duties on the basis of maximum available fault current.

D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 241 and IEEE 242.

1. Transformers:

a. ANSI C57.12.10
b. ANSI C57.12.22
c. ANSI C57.12.40
d. IEEE C57.12.00
e. IEEE C57.96

2. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.
3. Low-Voltage Fuses: IEEE C37.46.
4. Circuit Breakers: IEEE c37.13.

E. Study Report: Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.

F. Equipment Evaluation Report:

1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

G. A table shall be included which lists the calculated short-circuit currents (rms symmetrical three phase), equipment short-circuit interrupting or withstand current ratings, and notes regarding the adequacy or inadequacy of the equipment at each bus.

H. Any inadequacies shall be called to the attention of the engineer of record and recommendations made for improvements as soon as they are identified.

3.4 COORDINATION STUDY

A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.

1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.
2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
3. Calculate the maximum and minimum ground-fault currents.

B. Comply with IEEE 242 recommendations for fault currents and time intervals.

C. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.
b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.
3. Device settings shall protect transformers according to IEEE C57.12.91, for fault currents.

D. Motors served by voltages more than 600 V shall be protected according to IEEE 620.

E. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

F. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:

1. Tabular Format of Settings Selected for Overcurrent Protective Devices:

a. Device tag.
b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
d. Fuse-current rating and type.
e. Ground-fault relay-pickup and time-delay settings.

2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

a. Device tag.
b. Voltage and current ratio for curves.
c. Three-phase and single-phase damage points for each transformer.
d. No damage, melting, and clearing curves for fuses.
e. Cable damage curves.
f. Transformer inrush points.
g. Maximum fault-current cutoff point.

G. Completed data sheets for setting of overcurrent protective devices.

H. A table shall be included which lists the recommended settings of each circuit breaker and relay.

I. A sufficient number of log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.

J. Deficiencies in protection and/or coordination shall be called to the attention of the engineer of record and recommendations made for improvements as soon as they are identified.

K. The electrical engineer that performed the study shall be responsible to set the circuit breakers according to the analysis once the report has been approved by the engineer of record.

3.5 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D.

B. The analysis shall consider multiple possible utility scenarios as well as multiple system configurations where appropriate such as normal and emergency transfer switch positions and different main-tie-main configurations.

C. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system. This includes all switchboards, switchgear, motor-control centers, panelboards, busway, and splitters.

D. Safe working distances shall be based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm^2.

E. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations.

F. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment locations. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for all normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum and will assume a minimum motor contribution (all motors off). Conversely, the maximum calculation will assume a maximum contribution from the utility and will assume the maximum amount of motors to be operating. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable.

G. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators should be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond 3-5 cycles.
2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g. contributions from permanent magnet generators will typically decay from 10 per unit to 3 per unit after 10 cycles).

H. For each equipment location with a separately enclosed main device (where there is adequate separation between the line side terminals of the main protective device and the work location), calculations for incident energy and flash protection boundary shall include both the line and load side of the main breaker.

I. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.

J. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

K. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

L. Incident energy and flash protection boundary calculations

1. Arcing fault magnitude
2. Protective device clearing time
3. Duration of arc
4. Arc flash boundary
5. Working distance
6. Incident energy
7. Hazard Risk Category
8. Recommendation for arc flash energy reduction

M. The Arc Flash Hazard Analysis shall include recommendations for reducing Arc Flash Incident Energy (AFIE) levels and enhancing worker safety.

N. Results of the Arc Flash Hazard Analysis shall be submitted in tabular form and shall include the following information for each bus location: bus name, protective device name, bus voltage, bolted fault, arcing fault, trip/delay time, equipment type, working distance, arc flash boundary, incident energy and protective clothing category.

3.6 ARC FLASH WARNING LABELS

A. Arc flash labels shall be furnished and installed by the contractor of the Arc Flash Hazard Analysis.

B. The labels shall be 4 inches high by 6 inches wide and printed on a Brady THTEL-25-483-1-WA label type or similar. The arc flash label shall be formatted similarly to the examples shown below (Figure 1) and include the wording indicated in the table (Table 1) for each PPE category.

C. After labels will be based on recommended overcurrent device settings and will be provided after the results of the analysis have been presented to the Owner and after any system changes, upgrades or modifications have been incorporated in the system.

D. The label shall include the following information, at a minimum:

1. Arc Flash Incident Energy
2. Location designation
3. Nominal voltage
4. Arc Flash protection boundary
5. Hazard risk category
6. Incident energy
7. Working distance
8. PPE category
9. PPE clothing description
10. PPE equipment description
11. Voltage
12. Glove class
13. Shock protection boundaries according to NFPA 70E
14. Analysis date
15. Building number
16. Equipment name and the upstream tripping device.
17. Engineering report number, revision number and issue date.

E. Labels shall be machine printed, with no field markings.

F. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings. Provide arc flash labels for all electrical equipment including, but not limited to, the following:

1. For each 208-volt panelboard, one arc flash label shall be provided.
2. For each 208-volt distribution panelboard, one arc flash label shall be provided.
3. For each low-voltage switchboard, one arc flash label shall be provided.
4. For each fused or non-fused disconnect switch, one arc flash label shall be provided.

5. For each variable frequency drives, one arc flash label shall be provided.
6. For each combination starter/disconnects, one arc flash label shall be provided.
7. For each fused or non-fused disconnect switch and individual circuit breakers, one arc flash label shall be provided.
8. For each low-voltage transformer, one arc flash label shall be provided.

Figure 1. Example arc flash labels.

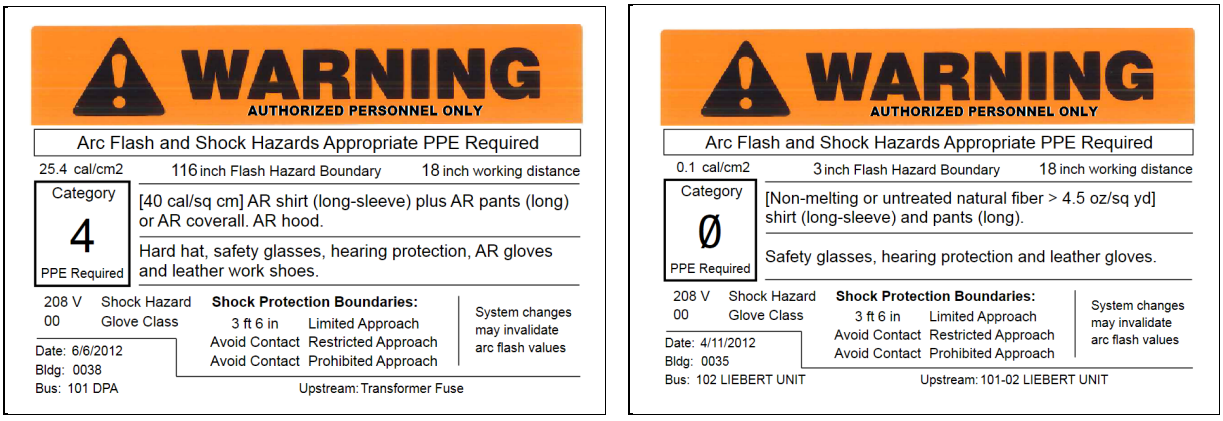


Table 1. Wording for the PPE related arc flash label fields.

Incident Energy (calories/cm^2)	PPE Category	PPE clothing	PPE equipment
0 - 1.2	0	[Non-melting or untreated natural fiber > 4.5 oz/sq yd] shirt (long-sleeve) and pants (long).	Safety glasses, hearing protection and leather gloves.
greater than 1.2 - 4	1	[4 cal/sq cm] AR shirt (long-sleeve) plus AR pants (long) or AR coverall. AR faceshield.	Hard hat, safety glasses, hearing protection, leather gloves and leather work shoes.
greater than 4 - 8	2	[8 cal/sq cm] AR shirt (long-sleeve) plus AR pants (long) or AR coverall. AR balaclava and AR face shield or AR hood.	Hard hat, safety glasses, hearing protection, leather gloves and leather work shoes.
greater than 8 - 25	3	[20 cal/sq cm] AR shirt (long-sleeve) plus AR pants (long) or AR coverall. AR hood.	Hard hat, safety glasses, hearing protection, AR gloves and leather work shoes.
greater than 25 - 40	4	[40 cal/sq cm] AR shirt (long-sleeve) plus AR pants (long) or AR coverall. AR hood.	Hard hat, safety glasses, hearing protection, AR gloves and leather work shoes.
greater than 40	X	Arc Flash Energy Exceeds the Rating of Category 4 PPE	Do not work on energized equipment

3.7 INSTALLATION/START-UP

A. The Electrical Contractor shall install equipment and protective devices in accordance with the approved short circuit and selective coordination study.

B. The Electrical Contractor shall field mark equipment with flash hazard analysis data as required in accordance with codes and standards.

C. The Manufacturer's engineer shall set all adjustable overcurrent and/or timing devices in accordance with the approved study results, and then test the devices.

D. The Manufacturer performing the study shall provide assistance to the installing Electrical Contractor during start-up of electrical system and equipment as needed.

END OF SECTION 260573

SECTION 262413 – LOW-VOLTAGE SWITCHBOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section Includes:

1. Service and distribution Switchboards rated 600 V and less.
2. Disconnecting and overcurrent protective devices.
3. Instrumentation.
4. Accessory components and features.
5. Identification.

B. Manufacturer shall provide Start-up Services for all Switchboards. Electrical Contractor shall schedule and complete the start-up services two (2) weeks prior to the switchboards being energized.

1.3 REFERENCES

A. The switchboard(s) and overcurrent protection devices referenced herein are designed and manufactured according to the following appropriate specifications.

1. ANSI/NFPA 70 - National Electrical Code (NEC).
2. ANSI/IEEE C12.16 - Solid-State Electricity Metering.
3. ANSI C57.13 - Instrument Transformers.
4. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
5. NEMA PB 2 - Deadfront Distribution Switchboards, File E8681
6. NEMA PB 2.1 - Proper Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.
7. NEMA PB 2.2 - Application Guide for Ground Fault Protective Devices for Equipment.
8. UL 50 - Cabinets and Boxes.
9. UL 98 - Enclosed and Dead Front Switches.
10. UL 489 - Molded Case Circuit Breakers.
11. UL 891 - Dead-Front Switchboards.
12. UL 943 - Standard for Ground Fault Circuit Interrupters.
13. Federal Specification W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit and Service.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of Switchboard, overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each Switchboard and related equipment.

1. Include dimensioned plans, front and side elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Conduit entrance locations and requirements; nameplate legends; one-line diagrams; equipment schedule; and switchboard instrument details.
3. Detail enclosure types for types other than NEMA 250, Type 1.
4. Detail bus configuration, current, and voltage ratings.
5. Detail short-circuit current rating of Switchboards and overcurrent protective devices.
6. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
7. Detail utility company's metering provisions with indication of approval by utility company.
8. Include evidence of NRTL listing for series rating of installed devices.
9. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
10. Include time-current coordination curves for each type and rating of overcurrent protective device included in Switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
11. Include diagram and details of proposed mimic bus.
12. Include schematic and wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For Switchboards and components to include in emergency, operation, and maintenance manuals. Include the following:

1. Routine maintenance requirements for Switchboards and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
3. Time-current coordination curves for each type and rating of overcurrent protective device included in Switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
2. Control-Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Indicating Lights: Equal to 10 percent of quantity installed for each size and type, but no fewer than one of each size and type.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

B. Source Limitations: Obtain Switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate space available for Switchboards including clearances between Switchboards and adjacent surfaces and other items. Equipment installed must meet all clearance, access and replacement working space requirements of the NEC and Owner.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NEMA PB 2.

F. Comply with NFPA 70.

G. Comply with UL 891.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver Switchboards in sections or lengths that can be moved past obstructions in delivery path.

B. Handle and prepare Switchboards for installation according to NECA 400 and NEMA PB 2.1. Lift only by lifting means provided for this express purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

C. Deliver, store, protect, and handle products in conformance with manufacturer's recommended practices as outlined in applicable Installation and Maintenance Manuals.

D. Each switchboard section shall be delivered in individual shipping splits for ease of handling. They shall be individually wrapped for protection and mounted on shipping skids.

E. Accept equipment on site and inspect and report concealed damage to carrier within their required time period.

F. Store in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect structure from dirt, water, construction debris, and traffic. Where applicable, provide adequate heating within enclosures to prevent condensation.

1.10 PROJECT CONDITIONS

A. Product Selection for Restricted Space: Drawings indicate space available for switchgear, including clearances between switchgear and adjacent surfaces and other items. Equipment installed must make all clearance, access and replacement working space requirements of the NEC and Owner.

B. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving Switchboards into place.

C. Environmental Limitations:

1. Do not deliver or install Switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above Switchboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
    b. Altitude: Not exceeding 6600 feet (2000 m).

1.11 COORDINATION

A. Coordinate layout and installation of Switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment,

raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.12 WARRANTY

A. The equipment items shall be supported by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

B. All low-voltage switchboards, finishes, and all of its component parts, and controls shall have an unconditional one (1) year warranty. Warranty shall include finishes and all components to be free from defects in materials and workmanship for a period of one (1) year from date of Owner’s acceptance. Replacement of low-voltage switchboards, faulty materials, and the cost of labor to make the replacement shall be the responsibility of the Contractor.

C. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

D. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: All surge suppression equipment shall be unconditionally warranted by the Contractor for a period of ten years from the date of substantial completion. If longer manufacturer's warranties are offered, they shall be made available to the Owner. Note these extended warranties in the Operations and Maintenance Manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Square D; a brand of Schneider Electric.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens
4. Eaton

B. Switchboards shall be service entrance labeled and listed by UL.

C. The manufacturer of the switchboard shall be the same as the manufacturer of the circuit breakers or the switches mounted in the switchboard.

D. All new panelboards, distribution panelboards and switchboards on this project shall be by the same manufacture as the switchboard for the purposes of stocking common breaker types, series ratings, etc.

E. Indoor Enclosure: Steel, NEMA 250, Type 1 - General Purpose.

1. Dead front construction.
2. Sections shall be aligned front and rear.
3. Removable steel base channels (1.5-inch floor sills) shall be bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting.

4. The switchboard enclosure shall be painted on all surfaces. The paint finish shall be a medium gray, ANSI #49, applied by the electro-deposition process over an iron phosphate pre-treatment.
5. All front covers shall be screw removable with a single tool and all doors shall be hinged with removable hinge pins.
6. Top and bottom conduit areas shall be clearly indicated on shop drawings.

F. Short Circuit Current Rating: Switchboards shall be rated with a minimum short circuit current rating of 100,000 AIC, unless otherwise indicated on Power Distribution Riser Diagram.

G. Nominal System Voltage: As indicated on Power Distribution Riser.

H. Main-Bus Continuous: As indicated on Power Distribution Riser.

I. Bus Composition: Shall be silver plated, hard-drawn copper of 98% conductivity. Plating shall be applied continuously to all bus work. The switchboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise requirements. The phase and neutral through-bus shall have an ampacity as shown in the plans. For 4-wire systems, the neutral shall be of equivalent ampacity as the phase bus bar. Tapered bus is not acceptable. Full provisions for the addition of future sections shall be provided. Bussing shall include all necessary hardware to accommodate splicing for future additions.

J. Bus Connections: Shall be bolted with Grade 5 bolts and conical spring washers.

K. Ground Bus: Sized per NFPA70 and UL 891 Tables 25.1 and 25.2 and shall extend the entire length of the switchboard. Provisions for the addition of future sections shall be provided.

L. Future Provisions: All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.

M. Insulation and isolation for main and vertical buses of feeder sections.

N. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchgear.

O. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

P. Phase-, Neutral- and Ground-Bus Material: Hard-drawn copper of 98 percent conductivity, silver-plated, with copper feeder circuit-breaker line connections.

Q. All bus bars shall extend full length of equipment to permit future additions.

R. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

S. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

T. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

U. All main and feeder breakers shall be provided with padlocks in the off position.

V. Provide equipment ground fault protection for all 3-phase, 120/208 volt for all overcurrent devices 1200 amps or greater.

2.2 INCOMING MAIN SECTION DEVICES

A. Fixed, Two-step stored energy electronic trip molded case circuit breaker(s)

1. Circuit protective devices shall be two-step stored energy type circuit breaker(s).
2. Circuit breaker trip system shall be a microprocessor-based true rms sensing design with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated schedules and drawings.

3. The integral trip system shall be independent of any external power source and shall contain no less than industrial grade electronic components.
4. Circuit breakers shall be equipped with back-up thermal and magnetic trip system.
5. The ampere rating of the circuit breaker shall be determined by the combination of an interchangeable rating plug, the sensor size, and the long-time pickup adjustment on the circuit breaker. The sensor size, rating plug and switch adjustments shall be clearly marked on the face of the circuit breaker. Circuit breakers shall be UL Listed to carry 100% of their ampere rating continuously when applied in QED switchboards.
6. The following time/current response adjustments shall be provided. Each adjustment shall have discrete settings and shall be independent from all other adjustments.

    a. Long Time Pickup & Long Time Delay
    b. Short Time Pickup & Short Time Delay (I^2t IN & I^2t OUT)
    c. Instantaneous Pickup
    d. Ground Fault Pickup & Ground Fault Delay (I^2t IN and I^2t OUT)
    e. Ground Fault Alarm Only Pickup

7. A means to seal the rating plug and trip unit adjustments in accordance with NEC Section 240-6(b) shall be provided.
8. Local visual trip indication for overload, short circuit and ground fault trip occurrences shall be provided.
9. An ammeter to individually display all phase currents flowing through the circuit breaker shall be provided. Indication of inherent ground fault current flowing in the system shall be provided on circuit breakers with integral ground fault protection. All current values shall be displayed in True rms with 2% accuracy.
10. Long Time Pickup indication to signal when loading approaches or exceeds the adjusted ampere rating of the circuit breaker shall be provided.
11. The trip system shall include a Long-Time memory circuit to protect against intermittent overcurrent conditions above the long-time pickup point. Means shall be provided to reset Long Time memory circuit during primary injection testing.
12. Circuit breaker trip system shall be equipped with an externally accessible test port for use with a Universal Test Set. Provide one (1) Universal Equipment Test Set for this project job for final inspection. This test set shall be suitable for testing all electric circuit breakers specified for this project. No disassembly of the circuit breaker is required for testing.
13. Communications capabilities for remote monitoring of circuit breakers trip system, to include phase and ground fault currents, pre-trip alarm indication, switch settings and trip history information shall be provided.
14. Circuit breakers shall be provided with Zone Selective Interlocking (ZSI) communications capabilities on the short time and ground fault functions compatible with all other electronic trip circuit breakers and external ground fault sensing systems as noted on schedules and drawings.
15. True two-step stored energy mechanism with five (5) cycle closing time shall be provided. All circuit breakers shall have multiple CHARGE/CLOSE provisions allowing the following sequence:
    CHARGE, CLOSE, RECHARGE, OPEN/CLOSE/OPEN
16. Local control pushbuttons to OPEN and CLOSE circuit breaker shall be provided. Color coded visual indication of contact position (OPEN or CLOSED) shall be provided on the face of the circuit breaker. Local manual charging following CLOSE operation shall be provided. Color coded visual indication of mechanism CHARGED, and DISCHARGED position shall be provided on the face of the circuit breaker. Visual indicator shall indicate CHARGED only when closing springs are completely charged.
17. Each circuit breaker shall be electrically operated to permit remote CHARGE, CLOSE, and OPEN capabilities. Electrically operated circuit breaker shall be equipped with charge contact switch for remote indication of mechanism charge status.
18. All circuit breakers shall be equipped with electrical accessories as noted on schedules and drawings.

19. Provide the following interlocking capabilities:

    a. cell door interlock
    b. key interlock for main-tie-main
    c. lock off

20. Equipment Ground Fault Protection

    a. Circuit breaker(s) shall be provided with integral equipment protection for grounded systems.
    b. The ground fault system shall be of the residual type.
    c. Circuit breaker(s) shall be provided with zone selective interlocking (ZSI) on the Ground Fault function in order to limit thermal stress caused by a fault yet permit optimum coordination with all other electronic trip circuit breakers.

21. Terminations

    a. All lugs shall be UL Listed to accept solid and/or stranded copper conductors only.
    b. All circuit breakers shall be UL Listed to accept field installable/removable lugs.

2.3 DISTRIBUTION SECTION DEVICES

A. Group mounted circuit breakers through 1200A

1. Circuit breaker(s) shall be group mounted plug-on with mechanical restraint on a common pan or rail assembly.
2. The interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.
3. Circuit breaker(s) equipped with line terminal jaws shall not require additional external mounting hardware. Circuit breaker(s) shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners. Circuit breaker(s) of different frame sizes shall be capable of being mounted across from each other.
4. Line-side circuit breaker connections are to be jaw type.
5. All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.
6. Electronic trip molded case standard function 80% rated circuit breakers

    a. All electronic circuit breakers shall have the following time/current response adjustments: Long Time Pickup, Long Time Delay, Short Time Pickup, Short Time Delay, Ground Fault Pickup, Ground Fault Delay, and Instantaneous settings. Each adjustment shall have discrete settings (fully adjustable) and shall be independent of all other adjustments.
    b. Circuit breaker trip system shall be a microprocessor-based true rms sensing designed with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated schedules and drawings.
    c. Long Time Pickup indication to signal when loading approaches or exceeds the adjustable ampere rating of the circuit breaker shall be provided.
    d. Furnish thermal magnetic molded case circuit breakers for 250A frames and below.
    e. All feeder breakers to be ZSI, Zone Selective Interlocking.

B. Individually mounted circuit breakers through 4000A

1. Electronic trip molded/insulated case full function 100% rated circuit breaker(s) through 4000A.

    a. All electronic circuit breakers shall have the following time/current response adjustments: Long Time Pickup, Long Time Delay, Short Time Pickup, Short Time Delay, Ground Fault Pickup, Ground Fault Delay and Instantaneous settings. Each adjustment shall have discrete settings (fully adjustable) and shall be independent of all other adjustments.

b. Circuit breaker trip system shall be a microprocessor-based true rms sensing designed with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated schedules and drawings.
c. Local visual trip indication for overload, short circuit, and ground fault trip occurrences.
d. Long Time Pickup indication to signal when loading approaches or exceeds the adjustable ampere rating of the circuit breaker shall be provided.
e. Communications capabilities for remote monitoring of circuit breaker trip system, to include phase and ground fault currents, pre-trip alarm indication, switch settings, and trip history information shall be provided.
f. Circuit breaker shall be provided with Zone selective Interlocking (ZSI) communications capabilities on the short-time and ground fault functions compatible with all other electronic trip circuit breakers and external ground fault sensing systems as noted on schedules and drawings.
g. All individually mounted feeder breakers above 1200 amps to be fixed mounted.
h. All feeder breakers to be ZSI, Zone Selective Interlocking.

2.4 SURGE PROTECTION DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
2. Square D; a brand of Schneider Electric.
3. Siemens
4. Eaton

B. Refer to specification 264313 for additional requirements.

C. Surge Protection Device Description: IEEE C62.41-compliant, integrally mounted, wired-in bolt-on, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sinewave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the switchgear short-circuit rating, and with the following features and accessories:

1. Integral fused disconnecting means for each surge protection device.
2. Fabrication using bolted compression lugs for internal wiring.
3. Integral disconnect shall be able to withstand the single surge rating of the SPD.
4. Redundant suppression circuits.
5. Redundant replaceable modules.
6. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
7. LED indicator lights for power and protection status.
8. Audible alarm, with silencing switch, to indicate when protection has failed.
9. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
10. Six-digit, transient-event counter set to totalize transient surges.
11. Provide with self-diagnostic test function.
12. SPD shall be UL labeled as Type 1 or Type 2.

2.5 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from switchgear. Include relay and meter test plugs suitable for testing switchgear meters and switchgear class relays.

C. Lock-out, Tag-out: All circuit breakers in the Switchboard to include fixed padlock attachments.

2.6 IDENTIFICATION

A. Service Equipment Label: NRTL labeled for use as service equipment for Switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine area to receive switchboard to provide adequate clearance for switchboard installation.

B. Check that concrete pads are level and free of irregularities.

C. Start work only after unsatisfactory conditions are corrected.

3.2 EXAMINATION

A. Receive, inspect, handle, and store switchgears according to NECA 400 and NEMA PB 2.1.

B. Examine Switchboards before installation. Reject Switchboards that are moisture damaged or physically damaged.

C. Examine elements and surfaces to receive Switchboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Install Switchboards and accessories according to manufacturer's written guidelines, NECA 400 and NEMA PB 2.1.

B. Equipment Mounting: Install Switchboards on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to Switchboards.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from Switchboard units and components.

D. Operating Instructions: Frame and mount the printed basic operating instructions for Switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of Switchboards.

E. Install filler plates in unused spaces of panel-mounted sections.

F. Install overcurrent protective devices, transient voltage suppression devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

G. Comply with NECA 1.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553, “Identification for Electrical Systems”.

B. Switchboard Nameplates: Label each Switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553, “Identification for Electrical Systems”.

C. Device Nameplates: Label each disconnecting, and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553, “Identification for Electrical Systems”.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each Switchboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

D. Tests and Inspections:

1. Tested to NETA standards by the manufacturer.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each Switchboard.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each Switchboard 11 months after date of Substantial Completion.
c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

d. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

4. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.
5. Measure, using a Megger, the insulation resistance of each bus section phase-to-phase and phase-to-ground for one minute each, at minimum test voltage of 1000 VDC; minimum acceptable value for insulation resistance is 1 megohms. NOTE: Refer to manufacturer's literature for specific testing procedures.
6. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturer's recommended torque values.
7. Physically test key interlock systems to check for proper functionality.

E. Test ground fault systems by operating push-to-test button.

F. Switchboard will be considered defective if it does not pass tests and inspections.

3.6 QUALITY CONTROL/STARTUP

A. Prepare test and inspection reports, including a certified report that identifies Switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7 ADJUSTING

A. Tighten bolted bus connections in accordance with manufacturer's instructions.

B. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

C. Set field-adjustable circuit-breaker trip ranges and time delay settings to recommended values in the Overcurrent Protective Device Coordination Study. Refer to 260573, “Electrical Studies”.

3.8 CLEANING

A. On completion of installation, inspect interior and exterior of switchboards. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair damaged finishes.

B. Touch-up scratched or marred surfaces to match original finish.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain Switchboards, overcurrent protective devices, instrumentation, and accessories, and to use and reprogram microprocessor-based trip, monitoring, and communication units.

B. Training of the owner’s operation and maintenance personnel is required in cooperation with the Commissioning Authority. The instruction shall be scheduled in coordination with the Commissioning Authority after submission and approval of formal training plans.

END OF SECTION 262413

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DESCRIPTION OF WORK

A. All panelboards shall be of the circuit breaker type and shall be of one manufacturer.

B. Branch panelboards shall be as indicated on the drawings and as specified herein. The lighting panelboards shall be of the dead-front, quick-make, quick-break, bolt-on circuit breaker type, with trip indicating and trip free handles. All circuits shall be clearly and properly numbered and shall be provided with thermal magnetic protection.

C. The panelboards shall be enclosed in code gauge, galvanized steel cabinets with smooth finished hinged doors without visible external fasteners and heavy chrome locks. Provide baked-on grey enamel finish, in accord with ANSI 61. Panels shall be constructed in accord with Federal Specification W-P-115B Type 1 Class 1, UL67, UL50, NEMA P31, and NFPA 70. Locks shall all be keyed alike.

D. Each door shall have a directory card inside, covered with a plastic shield, with typewritten circuit numbers and description indicated. Room numbers shall be coordinated with final room numbers as selected by Owner, not numbers on Contract Documents.

E. Panelboard trim for surface or flush panels shall be double-hinged type, to allow exposure of dead-front breaker portion behind locked door, with screw-fastened gutter trim that is hinged to allow full access to wiring gutters.

F. Special Note: The room numbers used to fill out the panel directories shall match the actual final name and numbering scheme selected by the Owner. They shall not be filled out per the construction drawing numbering scheme unless the Contractor is directed to do so by the Architect or Engineer.

G. Branch panelboards shall be surface or flush mounted as indicated on the Contract Drawings. Flush panels trims shall be tight to wall and interior barriers, with no gaps allowing access to live parts. Oversize trims will not be acceptable.

H. Note: Where mounted in groups, align top of trim or tub for all panels in an area. Exact mounting height of topline shall be as directed by the Engineer.

I. All main bus and connections thereto in panelboards shall be copper. All bus bars shall extend full length of panelboards.

J. All panelboards shall have full size un-insulated copper ground busses and insulated full neutral busses.

K. All panelboards shall be provided with an integral SPD per Specification 264313, Surge Protection for Low-Voltage Electrical Power Circuits.

1.4 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. GFCI: Ground-fault circuit interrupter

1.5 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, surge suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.6 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards. Submit final version after load balancing.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for panelboards and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
3. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each panelboard cabinet lock. All panelboard keys shall match.

1.9 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate space available for panelboards including clearances between panelboards and adjacent surfaces and other items. Furnish and install equipment to comply with NEC clearances.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NEMA PB 1.

F. Comply with NFPA 70.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Handle and prepare panelboards for installation according to NECA 407 and NEMA PB 1.

1.11 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager no fewer than 14 days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Construction Manager's written permission.
3. Comply with NFPA 70E.

1.12 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.13 WARRANTY

A. The equipment items shall be supported by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

B. All panelboards, finishes, and all of its component parts, and controls shall have an unconditional one (1) year warranty. Warranty shall include finishes and all components to be free from defects in materials and workmanship for a period of one (1) year from date of Owner’s acceptance. Replacement of panelboards, faulty materials, and the cost of labor to make the replacement shall be the responsibility of the Contractor.

C. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

D. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace surge suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. All panelboards shall be of the circuit breaker type and shall be of one manufacturer.

B. Enclosures: Flush- and surface-mounted cabinets. Box width shall not exceed 20" wide. Rated for environmental conditions at installed location.

1. Indoor Dry and Clean Locations: NEMA 250, Type 1.
2. Kitchen and Catering Areas: NEMA 250, Type 4X, Stainless Steel.

C. Type 1 Boxes

1. Boxes shall be hot zinc dipped galvanized steel constructed in accordance with UL 50 requirements. Unpainted galvanized steel is not acceptable.
2. Boxes shall have removable end walls. End walls shall not be provided with concentric knockouts. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
6. Finishes: Panels, Back Boxes and Trim: Galvanized Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
7. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.
8. All lock assemblies shall be keyed alike.

D. Incoming Mains Location: Top and bottom to match feeder conduit entry. Feeders routed through the side gutters to reach the top or bottom main breakers from the opposite end of the panel are not acceptable.

E. Phase, Neutral, and Ground Busses:

1. Material: Fully plated, hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Extend full length of panelboard and adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box. Provide where show on drawings.
4. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads. Provide when supplied by K rated transformers.
5. Split Bus: Vertical buses divided into individual vertical sections.

F. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Main and Neutral Lugs: Mechanical type.
2. Ground Lugs and Bus-Configured Terminators: Mechanical type.
3. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
4. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

5. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Square D; a brand of Schneider Electric.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike. For doors, more than 36 inches high, provide two latches, keyed alike.

D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Square D; a brand of Schneider Electric.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

E. Interior:

1. Continuous main current ratings, as indicated on associated drawings.
2. Short circuit rating as shown on the schedules.
3. Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors limited to bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing shall be plated copper. Bus bar plating shall run the entire length of the bus bar. Panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NEC Articles 230-F and -G.
4. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.
5. A solidly bonded copper equipment ground bar shall be provided.
6. Split solid neutral shall be plated and located in the mains compartment up to 250 amperes so all incoming neutral cable may be of the same length.

7. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have filler plates covering unused mounting space.
8. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, CSA/UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Square D; a brand of Schneider Electric.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Circuit breakers shall be CSA and UL Listed with amperage ratings, interrupting ratings, and number of poles as indicated on the panelboard schedules.
2. Molded case branch circuit breakers shall have bolt-on type bus connectors.
3. Circuit breakers shall have an over center toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.
4. There shall be two forms of visible trip indication. The circuit breaker handle shall reside in a position between ON and OFF. In addition, there shall be a red indicator appearing in the clear window of the circuit breaker housing.
5. The exposed faceplates of all branch circuit breakers shall be flush with one another.
6. Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors.
7. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
8. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
9. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
10. Instantaneous trip.
11. Long- and short-time pickup levels.
12. Long- and short-time time adjustments.
13. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
14. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
15. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
16. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
17. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

e. Shunt Trip: 120 V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
f. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.

2.5 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NECA 407.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

C. Mount top of trim 90 inches above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

E. Install overcurrent protective devices and controllers not already factory installed. Set field-adjustable, circuit-breaker trip ranges.

F. Install filler plates in unused spaces.

G. Stub four (4) 1-inch and two (2) 1-1/4”-inch empty conduits from recessed panelboard into accessible ceiling space or space designated to be ceiling space in the future.

H. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

I. Comply with NECA 1.

3.3 IDENTIFICATION

A. Each door shall have a directory card inside, covered with a plastic non-yellowing shield. Directory Card to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer to create directory in Microsoft Excel; handwritten directories are not acceptable. Digital versions to be provided to Owner.

B. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553.

C. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553.

3.4 QUALITY CONTROL/STARTUP: Major equipment and system startup and operational tests shall be scheduled and documented in accordance with Section 019113 Commissioning.

A. Functional Performance Tests: System functional performance testing is part of the Commissioning Process as specified in Section 019113. Functional performance testing shall be performed by the contractor and witnessed and documented by the Commissioning Authority.

B. Demonstration and Training: Training of the owner's operation and maintenance personnel is required in cooperation with the Commissioning Authority. The instruction shall be scheduled in coordination with the Commissioning Authority after submission and approval of formal training plans.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

3.7 ADJUSTING

A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES AND PLATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. This section of the specifications covers all wiring devices and cover plates, standard, weatherproof and dust-tight.

B. Wiring devices, listed by manufacturer and catalogue numbers are to establish the quality and type required. Equivalent devices of other manufacturers will be acceptable with prior approval of the Engineer. Submit cutsheets and/or samples of each type ten days prior to bid date for review and written approval to bid. Insofar as possible, standard application or special application devices shall be by one manufacturer.

C. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Receptacles with integral surge-suppression units.
4. Isolated-ground receptacles.
5. Tamper-resistant receptacles.
6. Weather-resistant receptacles.
7. Snap switches and wall-box dimmers.
8. Cord and plug sets.
9. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

C. TVSS: Transient voltage surge suppressor.

1.4 ADMINISTRATIVE REQUIREMENT

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
2. Leviton Mfg. Company Inc. (Leviton).
3. Pass & Seymour/Legrand (P&S).
4. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Straight-Blade Receptacles

1. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
2. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

a. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

3. Tamper-Resistant, Shutter-Type Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

D. SPD Receptacles

1. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 1449, and FS W-C-596, with integral SPD in line to ground, line to neutral, and neutral to ground.

a. SPD Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
b. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

2. Duplex SPD Convenience Receptacles: Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
3. Isolated-Ground, Duplex Convenience Receptacles:

a. Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.3 DEVICES

TYPE	RATING	CONFIGURATION	COLOR	VENDOR - CAT. #
RECEPTACLE, DUPLEX **PREMIUM GRADE**	125V, 20A	NEMA 5-20R	!	HUBBELL 5352 LEVITON or P & S Equal
	* USE WHERE ON DEDICATED 20A CKT., OR CALLED OUT ** USE WHERE ON DEDICATED 15A CKT., OR WHERE MORE THAN ONE RECEPTACLE ON A CIRCUIT			
RECEPTACLE, SAFETY SHUTTER TYPE DUPLEX	125V, 20A	NEMA 5-20R	!	HUBBELL LEVITON or P & S equal
RECEPTACLE, DUPLEX GFI WITH AUDIBLE ALARM	125V, 20A	NEMA 5-20R	!	P & S 2095 TRAN LEVITON or HUBBELL equal
RECEPTACLE, DUPLEX, WEATHER RESISTANT, GFI	125V, 20A	NEMA 5-20R	!	HUBBELL # GFTR20 LEVITON OR P & S Equal
RECEPTACLE, SIMPLEX	125V, 20A	NEMA 5-20R	!	HUBBELL 5361
RECEPTACLE, SINGLE	250V, 20A	NEMA 10-20R	BLACK	HUBBELL 6810 LEVITON or P & S Equal
RECEPTACLE, SINGLE	250V, 30A	NEMA 6-30R	BLACK	HUBBELL 9330 LEVITON or P & S Equal
RECEPTACLE, SINGLE	250V, 50A	NEMA 6-50R	BLACK	HUBBELL 9367 LEVITON or P & S Equal
SWITCH, SINGLE POLE	120/277V, 20A	SPST	!	HUBBELL HBL-1221 LEVITON or P & S Equal
SWITCH, THREE-WAY	120/277V, 20A	3-WAY	!	HUBBELL HBL-1223 LEVITON or P & S Equal

NOTES:
1. PROVIDE MATCHING CAP (PLUG) FOR ALL RECEPTACLES 30 AMP RATED AND ABOVE AS REQUIRED FOR EQUIPMENT.
2. ALL RECEPTACLES SHALL BE BACK OR SIDE-WIRED, CLAMPING TYPE
3. RECEPTACLES SHALL BE TAMPER RESISTANT AND WEATHER RESISTANT AND MARKED ACCORDINGLY AS REQUIRED BY NEC

! SEE PART 2.5, COLOR.

2.4 SMALL MOTOR CONTROL SWITCHES

A. For small line-to-neutral motor loads of 3/4 HP or less, single phase, rated at 120 or 277 volts, provide snap-type, HP rated motor starter switch with thermal overloads. Overload heaters sized to match the motor nameplate amperes and the ambient temperature shall be provided. Provide with NEMA 1, NEMA 3R or other enclosure suitable for the location and atmosphere. All manual starters in finished areas shall be in flush-mounted enclosures. If the motor to be controlled is not equipped with internal thermal overload protection, overload heaters sized to match the motor nameplate amperes and the ambient temperature shall be provided.

2.5 COLOR

A. Color of devices shall be as selected by the architect. Samples (devices, plates, or both) may be required to be submitted with other architectural color items by the Contractor. The Contractor shall coordinate any such submission required with other trades, the Prime Contractor or as needed.

B. Outlets connected to emergency power (generator) shall be red. Engrave plate with panel and circuit device is fed from.

C. Where devices are controlling or supplying emergency power from a standby source, the device color shall be red, as with switch toggles or receptacle fronts. Plate color shall match others on normal power in the building unless otherwise noted.

D. Where surface finishes next to the devices vary in color or shade throughout the project, the Contractor may be required to provide lighter or darker plates and devices to match wall finishes more closely. These variations are considered to be included in the original contract for construction.

2.6 PLATES AND COVERS

A. Unless otherwise specified or noted, all wiring device plates and covers shall be smooth thermoplastic, Hubbell "P" Series or equivalent G.E. or Leviton. Color shall be selected by Architect during shop drawing review.

B. Cover plates shall be of one manufacturer insofar as possible.

C. Weatherproof, while in use, plates for GFCI receptacles shall be cast aluminum, self-closing, gasketed, suitable for standard box mounting, UL listed for wet location use, cover closed. Vertical mounting - Hubbell WP26M, horizontal mounting - Hubbell WP26MH (die-cast zinc) or equivalent Leviton or P & S.

D. Weatherproof switch plates for toggle-handle switches shall be clear silicone rubber, for standard outlet boxes. Hubbell 1795 or equivalent P & S or Leviton.

E. Cover plates for computer, telephone or other system outlets shall be as color and finish to match receptacle plates in each space specified in other sections.

F. All kitchen and food service area plates shall be smooth 304 stainless steel with foam gasket behind to help prevent water infiltration.

2.7 FIRE-RATED POKE-THROUGH ASSEMBLIES

A. Manufacturers: Model numbers indicated on floor plans is basis-of-design. Subject to compliance with requirements, provide products by one of the following approved manufacturers:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Pass & Seymour/Legrand.
3. Square D/Schneider Electric.
4. Thomas & Betts Corporation.
5. Wiremold/Legrand.

B. Description:

1. Factory-fabricated and -wired assembly of below-floor junction box with multi-channeled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
2. Comply with UL 514 scrub water exclusion requirements.
3. Size: Selected to fit nominal 8-inch cored holes in floor and matched to floor thickness.
4. Fire Rating: Unit is listed and labeled for 2-hour fire rating of floor-ceiling assembly.
5. Closure Plug: Arranged to close unused cored openings and reestablish fire rating of floor.

2.8 FLOOR BOXES

A. Manufacturers: Model numbers indicated on floor plans is basis-of-design. Subject to compliance with requirements, provide products by one of the following approved manufacturers:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Pass & Seymour/Legrand.
3. Square D/Schneider Electric.
4. Thomas & Betts Corporation.
5. Wiremold/Legrand.

B. Description:

1. In general, floor boxes that are to contain multiple services such as power, data, voice, video, etc., shall be constructed of stamped steel and heavy thermoplastic with barriers or compartments to separate power from signal services per National Electrical Code.
2. Provide floor boxes with proper trim for carpet, wood, terrazo, tile or concrete floors, wiring slots, dust covers and proper device plates to hold outlets, jacks, etc. They shall be fully adjustable. Conduit rough-in shall be as required. All tops shall be capable of receiving an insert of the surrounding floor material.
3. Outlets for multi-service floor boxes shall be as specified elsewhere in these specifications.
4. Set boxes dead level with flooring and provide proper support by thickening concrete slab, welding angle iron across joists below or other approved means.

2.9 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.

B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:

C. Description:

1. Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
2. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.10 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.11 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. All wiring devices in dusty areas, exposed to weather and moisture shall be installed in Type "FS" conduit fittings having mounting hubs, with appropriate cover plates.

C. Devices that have been installed before painting shall be masked. No plates or covers shall be installed until all finishing and cleaning has been completed.

D. Provide GFCI duplex feed-thru style receptacles where indicated or required by the National Electrical Code, whether specifically called out or not. When a GFCI receptacle is on a circuit with other non-GFCI receptacles, it shall always be placed at the homerun point of the circuit and shall be wired to ground-fault interrupt protect the downstream outlets on that circuit unless specifically indicated to the contrary. Provide a "GFCI protected" label on each downstream outlet. GFCI receptacles shall audibly alarm when tripped.

E. All receptacles shall be installed with ground prong at bottom position.

F. All device face plates shall be labeled with panel and circuit designation by means of machine printed adhesive tape.

G. All device boxes shall have circuit number identified within the box.

H. Coordination for all receptacles except NEMA 5 Configuration: Contractor shall confirm receptacle configuration of all special purpose receptacles prior to installation and provide devices to match equipment. Contractor shall replace any incompatible receptacle discovered during owner move-in.

I. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

J. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

K. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. Use a torque screwdriver when a torque is recommended or required by manufacturer.
6. When conductors larger than #12 AWG are installed on 15- or 20-A circuits, splice #12 AWG pigtails for device connections.
7. Tighten unused terminal screws on the device.
8. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
9. Install switches with “OFF” position down.

L. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

M. Dimmers:

1. Install slide type dimmers within terms of their listing. Dimmers shall match load type.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to NEC and manufacturers' device listing conditions in the written instructions.

N. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION: Comply with Division 26 Section "Identification for Electrical Systems.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Wiring device will be considered defective if it does not pass tests and inspections.

C. Tests for Convenience Receptacles:

1. Line-Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

D. Wiring device will be considered defective if it does not pass tests and inspections.

E. Prepare and submit test and inspection reports.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600V ac and less for use in control circuits, enclosed switches, panelboards, switchboards, enclosed controllers, and motor-control centers.
2. Spare fuse cabinet.

1.3 SUBMITTALS

A. Product Data: Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Let-through current curves for fuses with current-limiting characteristics.
3. Time-current curves, coordination charts and tables, and related data.
4. Fuse size for elevator feeders and elevator disconnect switches.

B. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

1. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

C. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 1 Section "Closeout Procedures," include the following:

a. Let-through current curves for fuses with current-limiting characteristics.
b. Time-current curves, coordination charts and tables, and related data.
c. Ambient temperature adjustment information.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with:

1. NEMA FU 1 – Low Voltage Cartridge Fuses.
2. NFPA 70 – National Electrical Code.
3. UL 198C – High-Interrupting-Capacity Fuses, Current-Limiting Types.
4. UL 198E – Class R Fuses.
5. UL 512 – Fuse holders.

1.5 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Fuses: Equal to ten (10) percent of quantity installed for each size and type, but no fewer than three of each size and type.

C. Fuse Pullers: Two (2) for each size and type.

1.7 WARRANTY

A. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace fuses that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Owner’s acceptance.

1.8 PROJECT CONDITIONS

A. A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussmann, Inc.
2. Ferraz Shawmut, Inc.
3. LittleFuse

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.3 FUSE APPICATIONS

A. Circuits 601 to 6000 amperes shall be protected by current limiting BUSSMANN HI-CAP TIME DELAY FUSES KRP-C. Fuses shall employ "O" rings as positive seals between the end bells and the fuse barrel. Fuses shall be a time-delay type and must hold 500% of rated current for a minimum of 5 seconds, clear 20 times rated current in .01 seconds or less and be listed by Underwriter's Laboratories, Inc., with an interrupting rating of 200,000 amperes RMS symmetrical. The fuses shall be UL Class L.

B. Circuits 0 to 600 amperes shall be protected by current limiting BUSSMANN LOW-PEAK Dual Element Fuses, LPN-RK (250 volts) or LPS-RK (600 volts). All dual element fuses shall have separate overload and short circuit elements. Fuse shall incorporate a spring activated thermal overload element having a 284NF melting point alloy and shall be independent of the short-circuit clearing chamber. The fuse shall hold 500% of rated current for a minimum of l0 seconds and be listed by Underwriters Laboratories, Inc. with an interrupting rating of 200,000 amperes RMS symmetrical. The fuses shall be UL Class RK1.

C. Motor Circuits - All individual motor circuits rated 480 amperes or less shall be protected by BUSSMANN LOW PEAK DUAL-ELEMENT FUSES LPN-RK (250 volts) or LPS-RK (600 volts). The fuses for 1.15 service factor motors shall be installed in rating approximately l25% of motor full load current except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuse should be 150% to 200% of the Type KRP-C HI-CAP Time Delay Fuses of the rating shown on the drawings. 1.0 service factor motors shall be protected by BUSSMANN LOW-PEAK Dual-Element Fuses LPN RK (250 volts) or LPS-RK (600 volts) installed in rating approximately 115% of the motor full load current except as noted above. The fuses shall be UL Class RK1 or L.

D. Circuit breaker panels shall be protected by BUSSMANN LOW-PEAK Dual Element fuses LPN-RK (250 volts) or LPS-RK (600 volts) as shown on the drawings. The fuses shall be UL Class RK1.

2.4 LIGHTING BALLAST/DRIVER/TRANSFORMER FUSES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussman, Inc. – GLR fuses with HLR holder.
2. Tracor, Inc.; Littelfuse, Inc. Subsidiary – LGR fuses with LHR-000 holder.
3. Ferraz Shawmut, Inc. – SLR fuses.

B. Provide each lighting ballast/driver/transformer with individual protection on the line side.

C. Provide fuse and holder mounted within or as part of the fixture.

D. Provide fuse size and type recommended by the fixture manufacturer.

2.5 SPARE-FUSE CABINET

A. Manufacturer: Bussmann #SFC-FUSE-CAB spare fuse cabinet or equal.

B. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

C. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.

D. Finish: Gray, baked enamel.

E. Identification: "SPARE FUSES" in 1-1/2-inch-high white letters on black lamicoid plate. Mount plate on exterior of door.

F. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION:

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Fuses shall be installed when equipment is ready to be energized, including thorough cleaning and tightening of all electrical connections.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Fuses shall be shipped separately. Any fuses shipped installed in equipment, shall be replaced by the Electrical Contractor with new fuses as specified above prior to energizing at no additional expense to Owner. All fuses shall be stored in moisture free packaging at job site and shall be installed immediately prior to energizing of the circuit in which it is applied.

B. No fuses shall be installed in the equipment until the installation is complete, including tests and inspections required prior to being energized. All fuses shall be of the same manufacturer to ensure retention of selective coordination, as designed.

C. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

D. Install spare-fuse cabinet(s). Locate in Main Mechanical/Electrical Room.

E. Upon completion of the building, the Contractor shall provide the Owner with spare fuses in Spare-Fuse Cabinet.

3.3 IDENTIFICATION

A. Install as part of the lamicoid identification labels indicating fuse rating and type on outside of the door on each fused switch.

END OF SECTION 262813

SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section includes:

1. Fusible Switches
2. Non-Fusible Switches
3. Individually Mounted Circuit Breakers
4. Combination Starter/Disconnect Switches
5. Enclosures.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter

B. HD: Heavy Duty

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For each type of enclosed switch, circuit breaker, accessory, and component indicated.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

B. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches, circuit breakers, accessory, and component indicated from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate space available for enclosed switches including clearances between enclosed switches and adjacent surfaces and other items. Furnish and install equipment to comply with NEC clearances.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 WARRANTY

A. The equipment items shall be supported by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

B. All enclosed switches and circuit breakers, finishes, and all of its component parts, and controls shall have an unconditional one (1) year warranty. Warranty shall include finishes and all components to be free from defects in materials and workmanship for a period of one (1) year from date of Owner’s acceptance. Replacement of enclosed switches and circuit breakers, faulty materials, and the cost of labor to make the replacement shall be the responsibility of the Contractor.

C. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

D. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace surge suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Square D; a brand of Schneider Electric.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens.

2.2 NON-FUSIBLE SWITCHES

A. All non-fusible safety switches shall be Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. All safety switches shall have switch blades that are fully visible in the "OFF" (open) position with the door open.

C. All safety switches shall have a factory installed ground lug.

D. All safety switches shall have a factory installed neutral lug, when a neutral is necessary.

E. All current carrying parts shall be plated by an electrolytic process to resist corrosion and to promote cooling.

F. Switch mechanism shall be quick-make, quick-break, load break rated, such that during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing and opening action of the contacts has started. The handle and mechanism shall be an integral part of the box (not cover) with facilities for pad locking in the open or closed position with up to three padlocks. Switch doors shall be interlocked with switch handle so that the door can only be opened when the switch is in the "OFF" (open) position.

G. Provide the following Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 FUSIBLE SWITCHES

A. All fusible safety switches shall be Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. All safety switches shall have switch blades that are fully visible in the "OFF" (open) position with the door open.

C. All safety switches shall have a factory installed ground lug.

D. All safety switches shall have a factory installed neutral lug, when a neutral is required.

E. All current carrying parts shall be plated by an electrolytic process to resist corrosion and to promote cooling.

F. Switch mechanism shall be quick-make, quick-break, load break rated, such that during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing and opening action of the contacts has started. The handle and mechanism shall be an integral part of the box (not cover) with facilities for pad locking in the open or closed position with up to three padlocks. Switch doors shall be interlocked with switch handle so that the door can only be opened when the switch is in the "OFF" (open) position.

G. Provide the following Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.4 INDIVIDUALLY MOUNTED MOLDED-CASE CIRCUIT BREAKERS

A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

B. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

C. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.

D. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

E. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

F. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.

2.5 COMBINATION STARTER/DISCONNECT SWITCHES

A. All combination starter/disconnect switches shall be full-voltage, non-reversing type.

B. All combination starter/disconnect switches shall have low-voltage protection, solid state overloads, Hands-Off-Auto selector switch and Red and Green pilot lights.

C. All combination starter/disconnect switches shall be Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Combination motor starters shall be rated in accordance with NEMA sizes and horsepower ratings. No starter shall be listed as a fractional size.

E. Contactor contacts shall be silver alloy, double break, and shall allow for inspection on NEMA Sizes 00 through 4 without the use of tools. Size 5 and larger shall allow for inspection utilizing standard tools. They shall be replaceable without removing the line, load, or control wiring from the starter, and replaceable without removing the starter from the enclosure.

F. Contactor coils shall be the encapsulated type and shall be replaceable on NEMA Sizes 00 through 4 without the use of tools. Size 5 and larger shall be replaceable with standard tools. They shall be replaceable without removing the line, load, or control wiring from the starter, and replaceable without removing the starter from the enclosure.

G. Overload protection shall be provided by solid state electronic overload relay. Single-phase starters shall provide one- or two-leg overload protection; three-phase starters shall provide three-leg overload protection.

H. Combination starter shall be suitable for straight through wiring.

I. Switch mechanism shall be quick-make, quick-break, load break rated, such that during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing and opening action of the contacts has started. The handle and mechanism shall be an integral part of the box (not cover) with facilities for pad locking in the open or closed position with up to three padlocks. Switch doors shall be interlocked with switch handle so that the door can only be opened when the switch is in the "OFF" (open) position.

J. All safety switches shall have a factory installed ground lug.

K. All safety switches shall have a factory installed neutral lug, when a neutral is necessary.

L. All current carrying parts shall be plated by an electrolytic process to resist corrosion and to promote cooling.

M. Provide the following Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.6 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers and combination starters for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Install fuses in fusible devices.

C. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 CLEANING

A. On completion of installation, inspect interior and exterior of enclosed switches and circuit breakers and combination starters. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Electrical Studies".

END OF SECTION 262816

SECTION 264313 - SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section includes integral panelboard mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

B. The Contractor shall provide the necessary labor, materials, wiring and services necessary to provide the complete electrical surge protection systems as specified herein.

C. Provision of Surge Suppression Units at certain points in the power distribution network and on telephone and television service lines.

D. Proper installation of surge suppression unit(s), in accord with shop drawings. Wiring routing, grounding and all connections shall be in exact accord with manufacturer's recommendations.

1.3 DEFINITIONS

A. MCOV: Maximum continuous operating voltage.

B. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

C. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

D. OCPD: Overcurrent protective device.

E. SCCR: Short-circuit current rating.

F. SPD: Surge protective device.

G. VPR: Voltage protection rating.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data, for each type of product, on surge protection systems and components as part of shop drawing submissions. Indicate all capacity ratings, clamp times, maximum capacities, physical construction, and listing agency approvals. Submittals shall include UL 1449, 3rd Edition Listing documentation verifying:

1. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.
2. Short Circuit Current Rating (SCCR).
3. Voltage Protection Ratings (VPRs) for all modes.
4. Maximum Continuous Operating Voltage rating (MCOV). The MCOV shall be a tested value per UL1449 3rd Edition, section 37.7.3. MCOV values bases solely on the components used in the construction of the SPD will not be accepted.
5. I-nominal rating (I-n).
6. Type 1 or Type 2 Device Listing.

7. Manufacturer shall provide written test report showing the SPD can survive a single surge at its rated value without the use of circuit breakers or fuses.
8. kA rating per phase.
9. kA rating per mode.

B. Submittals shall also include the following:

1. Line drawings detailing dimensions and weight of enclosure.
2. Listing and rating of all modes of protection in each type of SPD required.
3. Breaker sizes used for SPD service disconnects.
4. Wiring diagram showing all manufacturer installed wiring including wire size, type, routing, and exact length of conductors.
5. Listing of equipment where each type of SPD is installed.

C. Maintenance Data: Submit maintenance instructions for surge suppression system. Include this data in Operation and Maintenance manuals.

1.5 QUALITY ASSURANCE

A. STANDARDS – Most Recent Edition of

1. Underwriters Laboratories: UL1449, 3RD Edition
2. ANSI/IEEE C62.41.1-2002, C62.41.2-2002, C62.45-2002
3. National Electrical Code: Article 285

B. Manufacturer shall be regularly engaged in production of surge protection equipment of types, sizes and ratings required, whose products have been satisfactorily used in similar service for not less than three years.

C. LISTING REQUIRMENTS: Comply with NEC and NFPA requirements, as applicable to materials and installation of surge protection components and wiring. Surge protection equipment shall be UL listed and labeled for its intended use. “Manufactured in accordance with” is not equivalent to UL listing and does not meet the intent of this specification. Where applicable, equipment shall comply with ANSI standards for such equipment. All equipment shall be tested per IEEE testing standards listed in this section.

D. SPECIAL NOTE: The physical routing, length, and connections of the unit's phase, neutral and ground conductors are critical to the performance of surge suppression units. All wiring shall be installed by the manufacturer prior to shipping equipment and shall not exceed three feet of length.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace SPDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: All surge suppression equipment shall be unconditionally warranted by the Contractor for a period of ten (10) years from the date of substantial completion. If longer manufacturer's warranties are offered, they shall be made available to the Owner. Note these extended warranties in the Operations and Maintenance Manuals.

B. The equipment items shall be supported by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

C. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS: Subject to compliance with requirements, provide products by one of the following:

1. Square D; a brand of Schneider Electric.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens
4. Eaton

2.2 BUILDING ELECTRICAL SERVICE SURGE PROTECTION DEVICES

A. Provide UL listed and labeled lightning and transient surge protection devices (SPD's), installed where shown on the drawings and in accord with the manufacturer's recommendations. The surge protection devices shall be shunt type and poly-phase, with the ability to conduct high energy transients from line to neutral and neutral to ground.

B. Surge Protection Device Description: IEEE C62.41-compliant, integrally mounted, wired-in bolt-on, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sinewave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the switchgear short-circuit rating.

C. Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.

D. SPD shall be UL labeled with 200kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.

E. Internal Device Overcurrent Protection (Fusing): All protection modes (including Neutral to Ground) of each surge suppression device shall be internally fused at the component level with fuse I^2T capability allowing the suppressor's maximum rated transient current to pass through the suppressor without fuse operation. If the rated I^2T characteristic of the fusing is exceeded, the fusing shall be capable of opening in less than one millisecond and clear both high and low impedance fault conditions. The fusing shall be capable of interrupting up to 200kA symmetrical fault current with 600 VAC applied. This overcurrent protection circuit shall be monitored, to provide indication of suppression failure. Conductor level fuses or circuit breakers internal or external to the surge suppression units are not acceptable as meeting this requirement.

F. SPD shall be UL labeled as Type 1 or Type 2, intended for use without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal over-temperature controls.

G. Each MOV shall be individually fuse-protected to avoid cascading faults. This shall be certified by Manufacturers letter of compliance.

H. SPD shall be UL labeled with 20kA nominal (I-n) (verifiable at UL.com) for compliance with UL 96A Lightning Protection Master Label and NFPA 780.

I. SPD shall provide surge current paths for all modes of protection: L-L, L-N, L-G, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.

J. UL 1449, 3rd Edition Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

System Voltage	L-N	L-G	L-L	N-G	
208Y/120		700V	700V	1200V	700V
480Y/277		1200V	1200V	1800V	1200V

Note : Numerically lower values are allowed/preferred ; outdated Suppressed Voltage Ratings (SVRs) shall not be submitted.

K. UL 1449, 3rd Edition Listed Maximum Continuous Operating Voltage (MCOV):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
208Y/120	25%	150V
480Y/277	15%	320V

L. Units shall be provided integral to panelboards, distribution panelboards and switchboard.

M. For each SPD, provide unit function status indicators. These indicators may be mounted in the face of the equipment panel or remotely, immediately adjacent to the panel. Provide minimum one green L.E.D. per phase illuminated for normal operation, red L.E.D. for trouble/fault or reduction of surge suppression capacity.

N. Proposed substitutions for the manufacturer's model numbers listed here shall meet or exceed the current published performance data for the units listed and shall be submitted to the Engineer ten working days prior to bid for review.

2.3 MAIN SERVICE SWITCHBOARD SURGE SUPPRESSION

A. Main service entrance switchboard units shall be installed as indicated on the contract documents and shall be heavy duty type. All units shall be 3 phase, 4 wire and shall have the following surge current capability (single pulse rated): Line to Neutral 300,000 amperes; Line to Ground 300,000 amperes; Line to Line 300,000 amperes; and Neutral to Ground 300,000 amperes. Per phase surge current rating shall be 600kA minimum. All MOV's shall be individually fused. The unit shall have a NEMA designed and certified safety interlocked integral disconnect switch with an externally mounted manual operator.

B. Provide an audible alarm with silence switch to alarm at unit on malfunction. Provide a surge counter for each unit to indicate each suppression operation of the unit. Provide with self-diagnostic test function.

C. Provide integral fused disconnecting means for each surge protection device. Integral disconnect shall be able to withstand the single surge rating of the SPD.

D. SPD shall be UL labeled as Type 1, intended for use without need for external or supplemental over-current controls.

2.4 PANELBOARD SURGE SUPPRESSION

A. Branch and distribution panelboard units shall be installed as indicated on the contract documents and shall be as manufactured by distribution equipment manufacturer. All units shall be 3 phase, 4 wire and shall have the following surge current capability (single pulse rated): Line to Neutral 100,000 amperes; Line to Ground 100,000 amperes; Line to Line 100,000 amperes; and Neutral to Ground 100,000 amperes. Per phase surge current rating shall be 200kA minimum. All MOV's shall be individually fused.

B. Provide 60A circuit breaker in panel being protected for unit disconnecting means. Utilize #3 AWG wire for connection to panelboard. Maximum wire length is three feet.

C. SPD shall be UL labeled as Type 1 or Type 2.

D. Provide a surge counter for each unit to indicate each suppression operation of the unit. Provide with self-diagnostic test function.

2.5 TELEPHONE AND TELEVISION SURGE SUPPRESSION

A. As a part of this section of work, the Contractor shall provide U.L. listed lightning and surge arrestors on the incoming telephone, video, and television service lines.

B. Arrestors shall be U.L. listed, properly grounded per N.E.C., and shall be located at the service entrance points for each cable. Also provide surge arrestors of the proper type for copper cables that are installed between buildings by the Contractor.

C. Arrestors for telephone lines shall be RJ-45 in/out, complete with RJ-45 jumpers as needed. Provide quantity as required, connecting one to each phone line. Provide two spare units to Owner for future use.

D. Arrestors for coaxial lines shall be 25 to 250 MHZ on cable T.V. lines (with BNC jacks in/out or as required by antenna connectors).

E. Provide a ground lug for individual surge suppression unit installations, with the recommended ground wire size routed back to the building main electrical ground.

F. Where multiple surge suppression units are installed, as at service entrance locations, provide a ground bar, copper with multiple tapped holes and a properly sized ground lead routed back to the building main electrical ground.

2.6 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

2.7 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 260519.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

C. Install SPDs as indicated and in accordance with equipment manufacturer's written instructions, in compliance with applicable requirements of NFPA, local prevailing codes and with UL lightning and power surge protection standards to ensure that surge suppression systems comply with requirements.

D. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

E. Use crimped connectors and splices only. Wire nuts are unacceptable.

F. Wiring: Power Wiring: Comply with wiring methods in Section 260519.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Compare equipment nameplate data for compliance with Drawings and Specifications.
2. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 264313

SECTION 265113 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section Includes:

1. Interior Luminaires
2. Building Mounted Exterior Luminaires
3. Exit Signs
4. Lamps, Ballasts, and Drivers
5. Luminaire Supports and Accessories

1.3 DESCRIPTION OF WORK

A. This work consists of providing all labor, materials, accessories, mounting hardware and equipment necessary for an operationally and aesthetically complete installation of all luminaries, including power wiring, control wiring and accessories, in accordance with the contract documents.

B. Contractor shall coordinate with Vendors and other trades, in advance of installation work, to define all infrastructure and installation requirements. Contractor shall coordinate all infrastructure requirements with all approved lighting equipment prior to infrastructure installation. This includes, but not limited to, appropriately sized, positioned, and located junction boxes, structural supports, feeds, power conduits and control conduits, and remote code-compliant power-supply enclosures.

C. Contractor shall provide all luminaires, as herein specified, complete with lamps, drivers, power supplies, ballasts, and accessories for safe and effective operation. All fixtures shall be installed and left in an operable condition with no broken, damaged, or soiled parts.

D. All luminaires, items, equipment, and parts furnished and specified herein shall bear the “UL Approved” label (or other NRTL label) to indicate compliance with UL requirements. All luminaires shall be manufactured in strict accordance with the appropriate and current requirements of the National Electrical Code as verified by Underwriters Laboratories, Inc. (UL), or tested to UL standards by other nationally recognized testing laboratory (NRTL) as acceptable to Building Officials and Code Administrators International (BOCAI); the International Conference of Building Officials (ICBO); or other relevant code authority recognized by the local jurisdiction within which the project is being constructed. Such a listing shall be provided for each luminaire type, and the appropriate label or labels shall be affixed to each luminaire in a location as required by code or law. All luminaires shall be UL/NRTL listed and labeled for installation in fireproof or non-fireproof construction, dry, damp, or wet locations, as required.

E. All available finishes and colors, for each luminaire, shall be submitted to the Architect for selection during shop drawing review. Premium finishes shall be provided at no additional cost premium.

F. Specifications and drawings are intended to convey all salient features, functions, and characteristics of the luminaires only, and do not undertake to illustrate or set forth every item or detail necessary for the work. Minor details, not usually indicated on the drawings nor specified, but that are necessary for proper execution and completion of the luminaries, shall be included, the same as if they were herein specified or indicated on the drawings.

G. The Owner, Architect and Engineer shall not be held responsible for the omission or absence of any detail, construction feature, etc. which may be required in the production of the light fixtures. The responsibility of accurately fabricating the light fixtures to the fulfillment of the specification rests with the Contractor.

H. Where emergency battery packs are provided with fixtures (if any), they shall be connected to an un-switched power line and wired in accord with applicable codes and the manufacturer's recommendations.

I. Refer to architectural details as applicable for recessed soffit fixtures or wherever fixture installations depend upon work of other trades. Coordinate all installations with other trades. Verify dimensions of spaces for fixtures, and if necessary, adjust lengths to assure proper fit and illumination of diffuser and/or area below.

J. Pre-manufactured flexible wiring systems are not permitted for this project.

K. In accordance with the above and the criteria established herein, the Contractor is responsible for assuring the final design, fabrication and installation which fulfills the requirements of the Contract Documents.

1.4 CODES: Materials and installations shall be in accordance with the latest revision of the National Electrical Code and any applicable Federal, State, and local codes and regulations.

1.5 REFERENCE STANDARDS: The publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. The publications may be referred to in the text by the basic designation only.

A. Any references in this specification to lighting mounted in, on, or to the exterior of the building or site are additionally governed by Specification Section 265619 EXTERIOR LIGHTING.

B. American National Standards Institute (ANSI):

1. ANSI C62.41 - Recommended Practice in Low Power Circuits
2. ANSI C78 Series - Physical and Electrical Characteristics of High-Intensity Discharge Lamps
3. ANSI C78.377 - Specifications for the Chromaticity of Solid-State Lighting Products
4. ANSI C81 Series - Electric Lamp Bases and Holders
5. ANSI C82.77 - Harmonic Emission Limits - Related Power Quality Requirements for Lighting Equipment
6. ANSI E1.20 - Remote Device Management Over DMX512 Networks
7. ANSI/IES RP-16-10 - Nomenclature and Definitions for Illuminating Engineering

C. Certified Ballast Manufacturers Association (CBM): Requirements for Ballast Certification.

D. Federal Communications Commission (FCC):

1. Code of Federal Regulations (CFR), Title 47, Part 18
2. Part 15 Class B: Radio Frequency Devices, Commercial Rated

E. Entertainment Services and Technology Association: ESTA E1.3 - Entertainment Technology - Lighting Control System - 0 to 10V Analog Control Protocol

F. International Electrotechnical Commission (IEC):

1. IEC 61000-3-2 - Harmonic Current Emissions
2. IEC 61347-1 - General and Safety Requirements for Lamp Control Gear
3. IEC 61347-2-13 - Particular Requirements for Electronic Control Gear for LED Modules
4. IEC 61547 - EMC Immunity Requirements

5. IEC 62384 - DC and AC Supplied Electronic Control Gear for LED Modules - Performance Requirements
6. IEC 62386-101 - Digital Addressable Lighting Interface - Part 101: General Requirements – System
7. IEC 62386-102 - Digital Addressable Lighting Interface - Part 102: General Requirements - Control Gear
8. IEC 62386-207 - Digital Addressable Lighting Interface - Part 207: Particular Requirements for Control Gear - LED Modules (device type 6)

G. Illuminating Engineering Society of North America (IESNA):

1. IES HB-10, IES Lighting Handbook – Tenth Edition
2. IES Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products, LM-79-08.
3. IES Approved Method for Measuring Lumen Maintenance of LED Light Sources, LM-80-08.
4. IES Approved Method for the Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature, LM-82.
5. IES Projecting Long Term Lumen Maintenance of LED Light Sources, TM-21.
6. IES ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information, LM-63.

H. Institute of Electrical and Electronic Engineers (IEEE): C62.41-91 - Recommended Practice on Surge Voltage in Low Voltage AC Power Circuits

I. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code (NEC), National Fire Protection Association
2. NFPA 101 - Life Safety Code, National Fire Protection Association

J. National Electrical Manufacturer's Association (NEMA):

1. NEMA FA1, - Outdoor Flood Lighting Equipment
2. NEMA SH5, - Tubular Steel, Aluminum and Prestressed Concrete Roadway Lighting Poles
3. NEMA SSL1 - Electronic Drivers for LED Devices, Arrays, or Systems
4. NEMA SSL3- High-Power White LED Binning for General Illumination
5. NEMA SSL7A - Phase Cut Dimming for Solid State Lighting: Basic Compatibility
6. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronics
7. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

K. OSHA 29CFR1910.7 – Luminaires shall be listed by National Recognized Testing Laboratory Approved by United States Department of Labor.

L. Underwriters Laboratories, Inc. (UL):

1. Underwriters Laboratories (UL) Standards
2. Underwriters Laboratories (UL) Standard for Class 2 Power Units
3. Underwriters Laboratories Safety Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products, UL 8750
4. UL 1310 - UL Standard for Safety Class 2 Power Units
5. UL 1598 - Luminaries
6. UL 924 - Standard for Emergency Lighting and Power Equipment

1.6 ACRONYMS AND DEFINITIONS

A. CCT: Correlated color temperature

B. CRI: Color-rendering index. A measure of the degree of color shift that objects undergo when illuminated by a lamp, compared with those same objects when illuminated by a reference source of comparable correlated color temperature (CCT)

C. CU: Coefficient of utilization

D. IECC: International Energy Conservation Code

E. LER: Luminaire efficacy rating, which is calculated according to NEMA LE 5.

F. Lumen: Delivered output of luminaire.

G. Light Fixture (Luminaire): Complete lighting unit consisting of a lamp(s) and driver(s)/ballast(s) (when applicable) together with the parts designed to distribute the light, to position and protect the lamp(s), and to connect the lamps to the power supply.

H. NRTL: Nationally Recognized Testing Laboratory

I. SPD: Surge Protection Device

J. RCR: Room cavity ratio.

K. UL: Underwriters Laboratory

L. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.

M. Total harmonic distortion (THD) is the root mean square (RMS) of all the harmonic components divided by the total fundamental current.

1.7 EQUAL MANUFACTURERS

A. Manufacturers listed as “Equal” to the Basis of Design on the light fixture schedule shall submit product cutsheets to the Engineer ten (10) days prior to bid for final written approval. This written approval will only be issued in addendum form. “Equal” fixtures shall be of equal or better quality and performance to the fixture(s) listed with manufacturer’s model numbers. Burden of proof shall be on the Contractor, Vendor, and manufacturer.

B. Upon request by Engineer, the Contractor shall submit manufacturer’s computerized horizontal illumination levels using AGI32 software in foot-candles at work plane (30" above finished floor), taken every 3 feet in every room and area. Include average maintained foot-candle levels and maximum and minimum ratio.

1.8 SUBMITTALS

A. Submittal data shall be in accordance with Division 01 SUBMITTAL Specification Section, IECC and as specified herein.

B. Eight (8) copies of light fixture factory shop drawings and cuts, showing fixture dimensions, photometric data and installation data shall be submitted to the Engineer for review 15 days after project award date. (Verify shop drawing quantities with the Architect.)

C. Data, drawings, and reports shall employ the terminology, classifications and methods prescribed by IESNA HB-10, as applicable, for the lighting system specified.

D. When catalog data and/or shop drawings for luminaires are submitted for approval, photometric data from an independent testing laboratory or one participating in the NIST National Voluntary Laboratory Accreditation Program (NVLAP) shall be included with the submittal, indicating average brightness and efficiency of the luminaire specified in specification or as shown on the drawings. Coefficient of utilization data is unacceptable.

E. Product data lacking sufficient detail to indicate compliance with contract documents will be rejected.

F. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.

3. All available finishes and colors for each luminaire type shall be submitted to the Architect for selection during review.
4. Life, output (lumens, CCT, and CRI), and energy-efficiency data for light fixtures.
5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
6. Distribution data according to IESNA classification type as defined in IESNA HB-10.
7. Amount of shielding on luminaires.

1.9 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 and NEMA unless more stringent requirements are specified or indicated.

D. Where groups of luminaire types exhibit the same list of acceptable Manufacturers, such as downlights, accents, and wall washers, the intent is to have a final installation with the same Manufacturer’s equipment across the groupings as specified for consistency of optics, aesthetics, and similarity of maintenance procedures. Mixing/matching across groups is unacceptable. This also applies to multi-phased projects with single or multiple, but related luminaire types exhibiting the same list of acceptable Manufacturers, except where products have subsequently been discontinued or significantly redesigned in size, appearance, lamping, or gear.

1.10 COORDINATION: Coordinate layout and installation of lighting fixtures with all other construction that penetrates ceilings or is supported by them, including HVAC equipment, plumbing, fire-suppression system, and partition assemblies. Refer to Architects reflected ceiling plan (RCP) for locations of all ceiling devices.

1.11 PRODUCT DELIVERY, STORAGE AND HANDLING: The Contractor shall provide, receive, unload, uncrate, store, protect and install lamps, luminaires, and auxiliary equipment, as specified herein, in accordance with respective manufacturers' project conditions of temperature and humidity and with appropriate protection against dust and dirt. Lamps for miscellaneous equipment shall be provided and installed by the Contractor according to equipment manufacturers’ guidelines. All products shall be stored in manufacturer's unopened packaging until ready for installation.

1.12 EXTRA MATERIALS

A. Furnish the following extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing content:

1. Single Sided Exit Sign: Furnish at least five (5) of each type.
2. Double Sided Exit Sign: Furnish at least five (5) of each type.
3. LED Drivers: One (1) for every fifty (50) of each type and rating installed. Furnish at least five (5) of each type.
4. LED Lamps/Boards: One (1) for every fifty (50) of each type and rating installed. Furnish at least five (5) of each type.

1.13 WARRANTIES

A. The equipment items shall be supported by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

B. All luminaries, finishes, poles and all of its component parts, and controls shall have an unconditional five (5) year warranty. Warranty shall include all light fixtures, lamps, drivers, poles, finishes and all components to be free from defects in materials and workmanship for a period of five (5) years from date of Owner's acceptance. Replacement of luminaries, faulty materials, and the cost of labor to make the replacement shall be the responsibility of the Contractor.

C. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

D. LED drivers: The warranty period shall not be less than ten (10) years from the date of substantial completion. The warranty shall state the malfunctioning LED driver shall be exchanged by the manufacturer and promptly shipped to the Owner. The replacement LED driver shall be identical to, or an improvement upon, the original design of the malfunctioning LED driver.

PART 2 - PRODUCTS:

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide one of the approved products indicated on the Light Fixture Schedule.

B. Subject to compliance with requirements, provide one of the products indicated on Light Fixture Schedule. Refer to Light Fixture Schedule for manufacturers and model numbers. Basis of Design for each light fixture type shall be the first fixture manufacturer and model number for each type listed. Refer to Specification Section 260500, paragraph EQUAL MANUFACTURERS for additional requirements.

C. Manufacturer's catalog numbers together with the descriptions on the drawings and these specifications are indicative of required design, appearance, quality, and performance. Refer any discrepancies between any of these to the Engineer for resolution prior to bid. In absence of such notice to the Engineer, provide the greater requirement as directed by the Engineer, without additional cost.

D. All luminaires shall be DLC (Design Lights Consortium) Certified.

E. The lighting equipment specified herein has been carefully chosen for its ability to meet the luminous environment requirements of this project. Calculations (with AGi32 or other such software) are generally performed to determine luminances, luminance ratios, and horizontal and vertical illuminances and respective ratios and to assess glare and reflected glare. In some instances, virtual reality "images" have been generated (with AGi32 or other such software) to assist the Lighting Designer, the Architect and/or the Owner in assessing the lighting quality of the space(s). Equipment and/or manufacturers which have been shown to comply with established criteria, including ASHRAE/IES 90.1 and IES guidelines and normal-power lighting requirements as applicable by ordinance, code, Federal law, mandate, or directive, and/or

intended LEED certification or other building-rating system, and other lighting standards as deemed appropriate for this specific project is specified herein.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES AND COMPONENTS

A. Comply with the requirements specified in the Articles below and the Light Fixture Schedule.

B. Complete luminaires shall be in accordance with NFPA 70, NEMA, and UL 1598 listed and labeled.

C. Provide luminaires complete with lamps of number, type, and wattage indicated.

D. Ballasts, drivers, or transformers, unless otherwise specified, shall be field replaceable and shall be serviceable while the fixture is in its normally installed position, and shall not be mounted to removable reflectors or wireway covers unless so specified.

E. Unless otherwise specified, a dedicated means of connecting light source to power shall be used in all luminaires unless otherwise specified and shall meet all UL requirements. LED modules shall be field replaceable.

F. Recessed fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

G. Luminaires shall be entirely factory wired by the luminaire manufacturer in accordance with code and UL requirements and shall be furnished fully compatible with the project electrical wiring and controls system for smooth, continuous, dimming or on/off flicker-free operation.

H. Provide in-line fuse-holders with fuses sized per manufacturer’s recommendation for each fixture.

I. Exterior building mounted light fixtures shall be UL classified for damp or wet locations as applicable and shall be complete with gaskets, cast aluminum outlet box and grounding. All dissimilar metal materials shall be separated by non-conductive materials to prevent galvanic action.

J. Provide all luminaires with a specific means for grounding their metallic wireways and housings to an equipment grounding conductor and ground accordingly upon installation.

K. All luminaires shall be provided with a ground wire and grounded accordingly upon installation.

L. All luminaires supplied for recessing in suspended ceilings shall be supplied with pre-wired junction boxes, unless otherwise specified.

M. Provide “maximum wattage label” on all light fixture based on the specified maximum wattage indicated on the light fixture schedule.

N. Metal parts: Free of burrs, sharp corners, and sharp edges.

O. Doors, frames, and other internal access: Smooth operating, free of light leakage under operating conditions. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidently during maintenance and when secured during operating position.

P. Mounting Frames and Rings: If ceiling system and luminaire type requires, each recessed and semi-recessed luminaire shall be furnished with a mounting frame or ring compatible with the ceiling in which they are to be installed as coordinated by Contractor. The frames and rings shall be one piece and of sufficient size and strength to sustain the weight of the luminaire and maintain plumb.

Q. Pendant Supports: Contractor shall be responsible for coordination with Manufacturer, Architect, Structural Engineer, and related trades to ensure that proper and adequate structural reinforcement is provided within ceilings to support pendant mounted lighting equipment for a secure, neat, square, plumb appearance. Pendants shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with lamps, globes, lenses, lens frames or doors etc. in place.

R. Wall Bracket (Sconce) Supports: Contractor shall be responsible for coordination with Manufacturer, Architect, Structural Engineer, and related trades to ensure that proper and adequate structural reinforcement is provided within walls to support wall mounted lighting equipment for a secure, neat, square, plumb appearance. Wall brackets shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with lamps, globes, lenses, lens frames or doors etc. in place.

S. All lenses or other light diffusing elements shall be removable for access to lamp and electrical and electronic components and luminaire cleaning, however, they must otherwise be positively and securely held in-place, unless otherwise specified.

T. There shall be no light leaks between the lens and the lens frame. All lens door or holder trim flanges shall fit plumb and flush with the ceiling or wall surface. There shall be no light leaks around the interface between lens door or holder trim flanges and the ceiling or wall.

U. Ballasts, drivers, or transformers, unless otherwise specified, shall be field replaceable and shall be serviceable while the fixture is in its normally installed position, and shall not be mounted to removable reflectors or wireway covers unless so specified.

V. Unless otherwise specified, a dedicated means of connecting light source to power shall be used in all luminaires unless otherwise specified and shall meet all UL requirements. LED modules shall be field replaceable.

W. Recessed luminaires mounted in an insulated ceiling shall be listed for use in insulated ceilings or provisions made to maintain code-compliant airspace around luminaires in accordance with Vendors' instructions.

X. Unless otherwise specified, luminaire closures (lens doors, trim frame, hinged housings, etc.) shall be retained in a secure manner by captive screws, chains, captive hinges, or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.

Y. Unless otherwise specified, luminaires with louvers or light transmitting panels shall have hinges, latches, and safety catches to facilitate safe, convenient cleaning and relamping. Vapor tight luminaires shall have pressure clamping devices in lieu of the latches.

Z. Yokes, brackets, and supplementary supporting members necessary for mounting lighting equipment shall be furnished and installed by the Contractor and approved by the Architect. All materials, accessories, and any other equipment necessary for the complete and proper installation of luminaires, lamps, ballasts/neon transformers included in the contract shall be furnished and installed by the Contractor. All yokes, brackets and supplementary supports shall provide a neat, square, plumb, and level appearance, and shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with all lamps, globes, lenses, lens frames or doors etc. in place.

AA. All connections shall be fixed rigid by screws, rivets and/or soldering. Screws and rivets shall not be visible except as necessary for maintenance and/or aesthetic appearance. Soldering shall be ground smooth to a clean, contiguous surface. All connections shall provide a neat, square, plumb, and level appearance, and shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with lamps, globes, lenses, lens frames or doors etc. in place.

BB. All sheet metal work shall be free from tool marks and dents and shall have accurate angles bent as sharp as compatible with the gauges of the required metal and the luminaire styling. All intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion after assembly.

CC. For steel and aluminum luminaires, all screws, bolts, nuts and other fastening and latching hardware shall be a cadmium or equivalent plated. For stainless steel luminaires, all hardware shall be stainless steel. For all bronze luminaires, all hardware shall be bronze.

DD. Extruded aluminum frames and trims shall be rigid and manufactured from quality aluminum without blemishes in the installed product. Miter cuts shall be accurate; joints shall be flush and without burrs and cut alignment maintained with the luminaire located in its final position.

EE. Outdoor Luminaires: Luminaires shall be suitably gasketed and vented according to manufacturer's instructions. All dissimilar metal materials shall be separated by non-conductive materials to prevent galvanic action.

FF. Luminaires in Hazardous Areas: Luminaires shall be suitable for installation in flammable atmospheres (Class and Group) as defined in NFPA 70 and shall comply with UL 844.

GG. Product procurement and coordination: Contractor shall:

1. Order products according to application
2. Confirm the proper and complete catalog number with distributor and agent.
3. Ensure wiring, driver, etc. meets the specifications and proper requirements.
4. Provide additional parts and pieces required to complete the installation in the location and manner intended by the design.

HH. Each light fixture shall be packaged with complete instructions and illustrations on how to install.

II. Each light fixture box, container, etc. shall be labeled at the factory with the type designation as indicated on the Light Fixture Schedule.

2.3 LUMINAIRE REFLECTORS AND TRIMS

A. Alzak cones, reflectors, baffles, and louvers shall be warranted against discoloration.

B. All cones, reflectors, baffles, and louvers shall be removable for lamp access and luminaire cleaning; however, they must otherwise be positively and securely held in-place.

C. All trims, reflectors and canopies shall fit snugly and securely to the ceiling or wall so that no light leak occurs.

D. Trims shall be self-flanged and white, unless otherwise specified.

E. For trim less or flangeless luminaires, Contractor shall coordinate with other Trades to achieve a trim less/flangeless installation acceptable to the Architect. Where ceilings are drywall or plaster, this involves Level 5 finishes or as otherwise directed by the Architect. In drywall, plaster, wood, or stone ceilings, special luminaire collars and exacting coordination are required of Contractor.

2.4 LIGHT EMITTING DIODE (LED) ELECTRONIC DRIVERS: The electronic driver shall at a minimum meet the following characteristics:

A. LED drivers shall comply with NEMA SSL 1, NFPA 70, and UL 8750 unless otherwise specified.

B. All LED luminaires shall use driver's integral to luminaires or as otherwise required by the luminaire manufacturer.

C. Driver shall comply with UL 1310 Class 2 requirements for dry and damp locations, NFPA 70 unless specified otherwise. Drives shall be designed for the wattage of the LEDs used in the indicated application. Drivers shall be designed to operate on the voltage system to which they are connected.

D. LED driver shall withstand up to a 1,000-volt surge without impairment of performance as defined by ANSI C62.41 Category A.

E. LED driver shall tolerate ±10 percent supply voltage fluctuation with no adverse effects to driver or LEDs.

F. LED driver forward voltage (Vf) shall be matched to LED board.

G. LED driver shall exhibit no visible change in light output with a variation of ±10 percent line voltage input.

H. Drivers for luminaires controlled by dimming devices shall be as specified herein and equipped for dimming and conform to the recommendations of the manufacturer of the associated dimming devices to assure satisfactory operation of the lighting system. Contractor shall coordinate all wiring infrastructure to accommodate final-selected drivers and controls systems for smooth, continuous, and flicker-free operation.

I. Flicker: The flicker shall be less than 5 percent at all frequencies below 1000 Hz and without visible flicker. Drivers shall meet or exceed NEMA 410 driver inrush standard.

J. Power factor shall be 0.95 (minimum).

K. Class A Sound Rating.

L. Current crest Factor of 1.5 or less.

M. LED driver total harmonic distortion (THD) shall be less than 20 percent for drivers unless otherwise specified. For dimming drivers, THD shall at no point in the dimming curve allow imbalance current to exceed full output THD.

N. All LED luminaires shall be fused on the primary side of the driver as recommended by the respective luminaire manufacturers.

O. All LED drivers shall be suitably sized to accommodate the LED array consistent with industry standards, including IEC standard 60929 Annex E.

2.5 LIGHT EMITTING DIODE (LED): The light emitting diodes shall as a minimum meet the following characteristic:

A. LED modules shall be manufactured by Cree, GE, Philips, Osram, Niche, or Xicato.

B. LED lamps shall comply with ANSI C78.1.

C. Chromacity of LED lamps shall comply with ANSI C78.377A and NEMA SSL-3.

D. Light emitting diodes shall be tested under IES LM-80 standards.

E. Color Rendering Index (CRI) shall be 84 (minimum).

F. Color temperature of 3,500K, or as indicated on light fixture schedule.

G. Rated lumen maintenance of 90% lumen output at 50,000 hours (minimum).

H. Rated lumen maintenance of 70% lumen output at 100,000 hours (minimum).

I. Provide light fixture types that the LED boards and drivers can be re-placed from the bottom and below ceiling. Trim for the exposed surface of flush-mounted fixtures shall be white or as indicated on light fixture schedule.

J. For color consistency, lamp maintenance consistency and for light output consistency, mixed lamps of the same lamp type from different manufacturers is unacceptable. Use the same brand and date code for all lamps except as otherwise specified. Contractor shall be responsible for coordinating all lamps and brand among all luminaire Vendor(s) and Contractor’s respective distributor(s).

2.6 SUSPENDED LUMINAIRES

A. Provide hangers capable of supporting twice the combined weight of fixtures supported by hangers. Provide with swivel hangers to ensure a plumb installation. Hangers shall be cadmium-plated steel with a swivel-ball tapped for the conduit size indicated. Hangers shall allow fixtures to swing within an angle of 45 degrees. Brace pendants 4 feet or longer to limit swinging. Single-unit suspended fixtures shall have twin-stem hangers. Multiple-unit or continuous row fixtures shall have a tubing or stem for wiring at one point and a tubing or rod suspension provided for each unit length of chassis, including one at each end. Rods shall be a minimum 0.18-inch diameter.

B. All suspended luminaires with a weight in excess of 150 pounds shall be fitted with safety cable of sufficient strength and length to meet all UL safety cable load-bearing requirements. Cable shall exhibit a finish (but not painted) compatible with that of the metal finish of the stem/chain/suspension-cable assembly or alternatively finished in black as approved by Architect. Shop drawings shall indicate luminaire weight. Contractor shall coordinate structural support/attachment requirements including independent structure for safety cable attachment with Vendor, Architect, and Structural Engineer and all respective trades. Safety cable shall exhibit sufficient length to wrap tightly and entirely around structural member at least twice before attachment subject to Vendor confirmation of UL requirements and pending Structural Engineer review. Contractor shall provide labor necessary for the stem/chain-assembly-wiring-threading and safety-cable-attachment as instructed by Vendor.

2.7 DOWNLIGHT FIXTURES AND COMPONENTS

A. Downlights shall be listed for thru-branch circuit wiring, recessing in ceilings and damp locations. Where installed in plaster or drywall or other inaccessible ceiling types, they shall be UL listed for bottom access.

B. Provide with tool-less hinged junction box access cover and thermal protection.

C. Provide telescoping channel bar hangers that adjust vertically and horizontally.

2.8 EXIT SIGNS

A. General requirements: UL 924, NFPA 70, AND NFPA 101. Exit signs shall use no more than 5 watts. Housing shall be made of die-cast aluminum. Provide stencil face and red lettering.

B. Provide single or double face as scheduled, indicated on plans, or as required by the local Authority Having Jurisdiction. Adjust installation position if required for clear visibility, in accordance with applicable codes.

C. Provide directional arrows (chevrons) as indicated on floor plans and to suit the means of egress or as required by the local Authority Having Jurisdiction.

2.9 LUMINAIRE SUPPORT HANGERS AND COMPONENTS

A. Wires: ASTM A641/A641M, Class 3, soft temper, galvanized regular coating, 0.1055 inches in diameter (12 gage).

B. Straps: Galvanized steel, one by 3/16 inch, conforming to ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.

C. Rod Hangers: Threaded steel rods, 3/16-inch diameter, zinc or cadmium coated.

2.10 FUSING: All luminaires shall be fused.

2.11 QUIPMENT IDENTIFICATION

A. Manufacturer's Nameplate: Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

B. Factory-Applied Labels: Provide labeled luminaires in accordance with UL 1598 requirements. All light fixtures shall be clearly marked for operation of specific LED’s and drivers according to proper type. The following characteristics shall be noted in the format "Use Only _____":

1. LED or lamp type, and nominal wattage
2. Driver or ballast type
3. Correlated color temperature (CCT) and color rendering index (CRI)
4. All markings related to lamp type shall be clear and located to be readily visible to service personnel, but unseen from normal viewing angles when lamps are in place. Drivers and ballasts shall have clear markings indicating multi-level outputs and indicate proper terminals for the various outputs.

2.12 FACTORY APPLIED FINISH: Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Architect's reflected ceiling plan (RCP) shows actual locations of all light fixtures, diffusers, and system devices. Report to the Architect/Engineer any conflicts. Do not scale plans for exact location of lighting fixtures.

B. Install luminaires in accordance with luminaire manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", and NEMA standards.

C. Electrical installations shall conform to and meet IEEE C2, NFPA 70, and to the requirements specified herein.

D. Installed luminaires shall be provided with protective covering by Contractor until such time as the space(s) is cleaned and ready for occupancy.

E. Align, mount and level the luminaires uniformly. All luminaires shall be installed plumb/true and level as viewed from all directions. Luminaires shall remain plumb and true without continual adjustment.

F. The Contractor shall coordinate the lighting system installation with the relevant trades so as to eliminate interferences with hangers, mechanical ducts, sprinklers, pipes, steel, etc. Avoid interference with and provide clearance for equipment.

G. Set luminaires plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved drawings. Mounting heights specified or indicated shall be to the bottom of fixture for ceiling-mounted fixtures and to center of fixture for wall-mounted fixtures. Obtain approval of the exact mounting for lighting fixtures on the job before commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed.

H. Recessed and semi-recessed fixtures shall be independently supported from the buildings structure by a minimum of four wires per fixture and located near each corner of each fixture. Ceiling grid clips are not allowed as an alternative to independently supported light fixtures. Round fixtures or fixtures smaller in size than the ceiling grid shall be independently supported from the building structure by a minimum of four wires per fixture spaced approximately equidistant around the fixture. Do not support fixtures by ceiling acoustical panels. Where fixtures of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support such fixtures independently and provide at least two 3/4-inch metal channels spanning, and secured to, the ceiling tees for centering and aligning the fixture. Provide wires for lighting fixture support in this section. Lighting fixtures installed in suspended ceilings shall also comply with the requirements of Division 09 Specification Sections GYPSUM BOARD, ACOUSTICAL PANEL CEILINGS and SUSPENDED DECORATIVE WOOD GRIDS. Support lay-in ceiling light fixtures as follows:

1. Support fixtures with four (4) wires, with one (1) at each corner. Hanger wires shall be installed within 15 degrees of plumb or additional support shall be provided. Wires shall be attached to fixture body and to the building structure (not to the supports of other work or equipment).
2. Where building structure is located such that 15 degrees cannot be maintained, the Contractor shall provide "Uni-strut" or similar structure to meet this requirement.
3. Support Clips: All fixtures shall be furnished with hold down clips to meet applicable seismic codes. Provide four (4) clips per fixture minimum or the equivalent thereof in the installation trim. Fasten to light fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application. Contractor shall install clips per manufacturer's requirements. If screws are required, they shall be provided.

I. Lighting Fixture Supports:

1. Shall provide support for all of the fixtures.
2. Shall maintain the fixture positions after cleaning and relamping.
3. Shall support the luminaires without causing the ceiling or partition to deflect
4. For installation in suspended ceilings, ensure that the luminaires are supported such that there is no resultant bowing or deflection of the ceiling system.

J. Luminaires installed and used for working light during construction shall be replaced prior to turnover to the Owner if more than 3 percent of their rated life has been used. Fixtures shall be tested for proper operation prior to turn-over and shall be replaced, if necessary, with new lamps from the original manufacturer.

K. All lamps shall be seasoned for a minimum of 12 hours and a maximum of 100 hours in full-on mode without dimming prior any dimming and prior to turn-over to Owner. All lamps used for convenience lighting during construction for periods collective operation longer than 100 hours and any lamps which have failed/burned-out shall be replaced with identical new lamps, which shall then be seasoned as described above, immediately prior to the date of substantial completion as determined by the Architect.

L. Suspended fixtures shall hang plumb and shall be located with no obstructions within the 45 degree range in all directions. The stem, cable, canopy and fixture shall be capable of 45 degree swing. Suspended fixtures in continuous rows shall have internal wireway systems for end to end wiring and shall be properly aligned to provide a straight and continuous row without bends, gaps, light leaks or filler pieces. Aligning splines shall be used on extruded aluminum fixtures to assure hairline joints. Steel fixtures shall be supported to prevent "oil-canning" effects. Fixture finishes shall be free of scratches, nicks, dents, and warps, and shall match the color and gloss specified. Pendants shall be finished to match fixtures. Aircraft cable shall be stainless steel. Canopies shall be finished to match the ceiling and shall be low profile unless otherwise shown.

M. Whenever a luminaire or its hanger canopy is installed directly to a surface mounted junction box, a finishing ring painted to match the ceiling, shall be used to conceal the junction box.

N. Rigidly align continuous rows of light fixtures for true in-line appearance.

O. Exit Signs and Emergency Lighting Units: Wire exit signs ahead of the switch to the un-switched emergency lighting life-safety branch circuit located in the same room or area.

P. Light fixture whips shall be supported from the building structure. Do not clip to lay-in ceiling support wires.

Q. Exterior Fixtures:

1. Exterior building mounted light fixtures shall not be installed until after the building exterior has been rinsed clean of any corrosive cleaning materials. Damaged fixtures shall be replaced by the Contractor at no cost.
2. Provide exterior rated waterproof junction boxes for all fixtures and splices.
3. Utilize weatherproof silicone filled wire nuts and seal all junction boxes and conduit with potting compound to create waterproof barriers. Inspect all splices and fixtures for continuity prior to potting.
4. Lubricate all threaded parts with a high temperature waterproof anti-seize lubricant, including lamp bases and sockets, to prevent seizing and corrosion.
5. All low-voltage wiring to be UV resistant, UL approved for use without conduit, stranded low-voltage wire (Q-Wire by Q-Tran or equal) for use in outdoor and underground applications, gauge as appropriate to avoid voltage drop.
6. Track Lighting: The Electrical Contractor shall allow for all track lighting to be wired with individual home runs (not looped) so invisible feeds (no junction box at end of track) may be utilized.

R. Transformers (applies to all transformers including (but not limited to) low voltage, neon, remote ballast, LED power supplies, exterior locations):

1. Electrical Contractor to locate all transformers (including low voltage, neon, remote ballasts, led power supplies, etc.) near fixtures in a well-ventilated and accessible location. Transformers must be installed (per codes) in accessible areas large enough to dissipate the heat of the transformer. Temperatures should not exceed 100°F (38°C).
2. Transformers should be mounted as close to the load/feed lamp holders as practical to keep the secondary feeds as short as possible.
3. Electrical Contractor to determine wire size according to load and wire length to eliminate voltage drop. If voltage drop is a problem after installation, the Electrical Contractor is responsible for reinstallation (at no additional cost) of transformer and wire to solve problem.
4. Electrical Contractor to label front of transformer with load name and load location. For example: “Large Display Case @ Entry to Main Dining Room.”

S. Light fixture locations in mechanical and electrical equipment rooms/areas, as indicated on floor plans, are approximate. Locate light fixtures to avoid equipment, ductwork, and piping. Locate around and between equipment to maximize the available light. Coordinate mounting heights and locations of light fixtures to clear equipment. Request a meeting with the Engineer if uncertain about an installation. All suspended light fixtures shall be mounted square and plumb.

T. Contractor shall be responsible for sealing all luminaires for wet locations (i.e., all knockouts, all pipe and wire entrances, etc.) to prevent water wicking.

U. Coordinate between the electrical and ceiling trades to ascertain that approved luminaires are furnished in the proper sizes, with the proper flange details, and installed with the proper devices (hangers, clips, trim frames, flanges), to match the ceiling system being installed.

V. All reflecting surfaces, glass or plastic lenses, ballast housings, parabolic louvers, downlighting alzak cones and specular reflectors and other decorative elements shall be installed after completion of ceiling tile installation, plastering, painting and general cleanup.

W. Handle all reflecting surfaces, glass or plastic lenses, ballast housings, parabolic louvers, downlighting alzak cones and specular reflectors and other decorative elements with care during installation or lamping to avoid fingerprints or dirt deposits.

X. It is preferred that louvers be shipped and installed with clear plastic bags to protect louvers. At close of project, and after construction air filters are changed, remove bags.

3.2 GROUNDING

A. Bond luminaires and metal accessories to the grounding system per National Electrical Code.

B. Ground noncurrent-carrying parts of equipment including luminaires, mounting arms, brackets, and metallic enclosures. Where copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.

3.3 IDENTIFICATION

A. Light fixtures served from multiple power sources, such as emergency fixtures fed from emergency transfer relay, shall have the following label affixed to it:

1. “DANGER - ELECTRICAL SHOCK HAZARD - LIGHT FIXTURE HAS MULTIPLE POWER SOURCES”

3.4 CLEANING

A. At completion of each phase and the time of final acceptance by the Owner, all lighting fixtures shall have been thoroughly cleaned with materials and methods recommended by the manufacturer.

B. Any louver or cone showing dirt or fingerprints shall be cleaned with solvent recommended by the manufacturer to a like-new condition or replaced as necessary in order to turn over to the Owner new fixtures at beneficial occupancy.

C. All fingerprints, dirt, tar, smudges, drywall mud and dust, etc. shall be removed by the Contractor from the luminaire bodies, reflectors, trims, and lens/louvers prior to final acceptance. All reflectors shall be free of paint other than factory-applied, if any.

3.5 TESTING AND ADJUSTMENT

A. The lighting and lighting controls systems shall be synchronized and fully operable to address the lighting operation in a complete and code-compliant manner.

B. All adjustable luminaires shall be aimed, focused, locked, etc., by the Contractor under the observation of the Architect. As aiming and adjusting is completed, locking setscrews and bolts and nuts shall be tightened securely by the Contractor.

C. Contractor shall coordinate with Architect to establish the number of two-member crews required for aiming and adjusting. All aiming and adjusting shall be performed after the entire installation is complete for each phase or area. The Contractor shall be responsible for notifying the Architect of appropriate time for final luminaire adjustment.

D. All ladders, scaffolds, lifts, gloves, cleaning cloths, access/adjustment tools, etc. required for aiming and adjusting luminaires shall be furnished by the Contractor.

E. Where possible, units shall be focused during the normal working day. However, where daylight interferes with seeing lighting effects, aiming shall be accomplished at night.

3.6 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data in accordance with Division 01 Specification Section SUBMITTALS and OPERATION AND MAITENANCE, IECC and as specified herein, showing all light fixtures, control devices and all interconnecting control wire, conduit, and associated hardware.

B. Contractor shall be responsible for obtaining from his supplying light fixture manufacturers, for each type of light fixture, a recommended maintenance manual including, tools required, types of cleaners to be used and replacement parts identification list.

C. Provide at least three (3) CDs/DVDs with high resolution PDF files of all equipment product data for Owner’s use in equipment identification and maintenance with recommended maintenance manuals including, at a minimum:

1. Vendor and local representative’s contact information
2. Tools required
3. Types of cleaners to be used
4. Replacement parts identification lists
5. Equipment product data (high-quality reproducible copies)
6. Warranty documentation

3.7 FIELD QUALITY CONTROL:

A. Upon completion of installation, verify that equipment is properly installed, connected, and adjusted. Conduct an operating test to show that equipment operates in accordance with requirements of this section.

B. Dimming Drivers. Test for full range of dimming capability. Observe for visually detectable flicker over full dimming range.

C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

D. Inspect each light fixture for damage. Replace damaged light fixtures at no cost to the Owner.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to four (4) visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.

1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION 265113

SECTION 265619 – EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section Includes:

1. Exterior Luminaires
2. Lamps, Ballasts, and Drivers
3. Luminaire Poles, Supports and Accessories

1.3 DESCRIPTION OF WORK

A. This work consists of providing all labor, materials, accessories, mounting hardware and equipment necessary for an operationally and aesthetically complete installation of all luminaries, including power wiring, control wiring and accessories, in accordance with the contract documents.

B. Contractor shall coordinate with Vendors and other trades, in advance of installation work, to define all infrastructure and installation requirements. Contractor shall coordinate all infrastructure requirements with all approved lighting equipment prior to infrastructure installation. This includes, but not limited to, appropriately sized, positioned, and located junction boxes, structural supports, feeds, power conduits and control conduits, and remote code-compliant power-supply enclosures.

C. Contractor shall provide all luminaires, as herein specified, complete with lamps, drivers, power supplies, ballasts, and accessories for safe and effective operation. All fixtures shall be installed and left in an operable condition with no broken, damaged, or soiled parts.

D. All luminaires, items, equipment, and parts furnished and specified herein shall bear the “UL Approved” label (or other NRTL label) to indicate compliance with UL requirements. All luminaires shall be manufactured in strict accordance with the appropriate and current requirements of the National Electrical Code as verified by Underwriters Laboratories, Inc. (UL), or tested to UL standards by other nationally recognized testing laboratory (NRTL) as acceptable to Building Officials and Code Administrators International (BOCAI); the International Conference of Building Officials (ICBO); or other relevant code authority recognized by the local jurisdiction within which the project is being constructed. Such a listing shall be provided for each luminaire type, and the appropriate label or labels shall be affixed to each luminaire in a location as required by code or law. All luminaires shall be UL/NRTL listed and labeled for installation in fireproof or non-fireproof construction, dry, damp, or wet locations, as required.

E. All available finishes and colors, for each luminaire, shall be submitted to the Architect for selection during shop drawing review. Premium finishes shall be provided at no additional cost premium.

F. Specifications and drawings are intended to convey all salient features, functions, and characteristics of the luminaires only, and do not undertake to illustrate or set forth every item or detail necessary for the work. Minor details, not usually indicated on the drawings nor specified,

but that are necessary for proper execution and completion of the luminaries, shall be included, the same as if they were herein specified or indicated on the drawings.

G. The Owner, Architect and Engineer shall not be held responsible for the omission or absence of any detail, construction feature, etc. which may be required in the production of the light fixtures. The responsibility of accurately fabricating the light fixtures to the fulfillment of the specification rests with the Contractor.

H. Where emergency battery packs are provided with fixtures (if any), they shall be connected to an un-switched power line and wired in accord with applicable codes and the manufacturer's recommendations.

I. Refer to architectural and civil details as applicable for recessed step fixtures, fixtures mounted in walkways or wherever fixture installations depend upon work of other trades. Coordinate all installations with other trades.

J. In accordance with the above and the criteria established herein, the Contractor is responsible for assuring the final design, fabrication and installation which fulfills the requirements of the Contract Documents.

1.4 CODES: Materials and installations shall be in accordance with the latest revision of the National Electrical Code and any applicable Federal, State, and local codes and regulations.

1.5 REFERENCE STANDARDS: The publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. The publications may be referred to in the text by the basic designation only.

A. Any references in this specification to lighting mounted in, on, or to the exterior of the building or site are additionally governed by Specification Section 265113 INTERIOR LIGHTING.

B. American Association Of State Highway And Transportation Officials (AASHTO)

1. AASHTO LTS-5(2009; Errata 2009; Amendment 1 2010; Amendment 2 2011) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals

C. American National Standards Institute (ANSI):

1. ANSI C62.41 - Recommended Practice in Low Power Circuits
2. ANSI C78.377 - Specifications for the Chromaticity of Solid-State Lighting Products
3. ANSI C81 Series - Electric Lamp Bases and Holders
4. ANSI C82.77 - Harmonic Emission Limits - Related Power Quality Requirements for Lighting Equipment
5. ANSI C136.21 (2004; R 2009) American National Standard for Roadway and Area Lighting Equipment - Vertical Tenons Used with Post-Top-Mounted Luminaires
6. ANSI C136.3 (2005; R 2009) American National Standard for Roadway and Area Lighting Equipment Luminaire Attachments
7. ANSI E1.20 - Remote Device Management Over DMX512 Networks
8. ANSI/IES RP-16-10 - Nomenclature and Definitions for Illuminating Engineering

D. ASTM International (ASTM)

1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
2. ASTM B108/B108M - Standard Specification for Aluminum-Alloy Permanent Mold Castings
3. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus

E. Certified Ballast Manufacturers Association (CBM): Requirements for Ballast Certification.

F. Federal Communications Commission (FCC):

1. Code of Federal Regulations (CFR), Title 47, Part 18
2. Part 15 Class B: Radio Frequency Devices, Commercial Rated

G. Entertainment Services and Technology Association: ESTA E1.3 - Entertainment Technology - Lighting Control System - 0 to 10V Analog Control Protocol

H. International Electrotechnical Commission (IEC):

1. IEC 61000-3-2 - Harmonic Current Emissions
2. IEC 61347-1 - General and Safety Requirements for Lamp Control Gear
3. IEC 61347-2-13 - Particular Requirements for Electronic Control Gear for LED Modules
4. IEC 61547 - EMC Immunity Requirements
5. IEC 62384 - DC and AC Supplied Electronic Control Gear for LED Modules - Performance Requirements
6. IEC 62386-101 - Digital Addressable Lighting Interface - Part 101: General Requirements – System
7. IEC 62386-102 - Digital Addressable Lighting Interface - Part 102: General Requirements - Control Gear
8. IEC 62386-207 - Digital Addressable Lighting Interface - Part 207: Particular Requirements for Control Gear - LED Modules (device type 6)

I. Illuminating Engineering Society of North America (IESNA):

1. IES HB-10, IES Lighting Handbook – Tenth Edition
2. IES RP-8 – Roadway Lighting
3. IES Approved Method for Life Performance Testing of General Lighting Incandescent Filament Lamps, LM-49.
4. IES Approved Method for Electrical and Photometric Measurements of General Service Incandescent Filament Lamps, LM-45.
5. IES Approved Method for Life Testing of High Intensity Discharge Lamps, LM-47.
6. IES Approved Method for Photometric Measurements of High Intensity Discharge Lamps, LM-51.
7. IES Approved Method for Photometric Testing of Indoor Luminaires Using High Intensity Discharge Lamps, LM-46.
8. IES Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products, LM-79.
9. IES Approved Method for Measuring Lumen Maintenance of LED Light Sources, LM-80.
10. IES Approved Method for the Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature, LM-82.
11. IES Projecting Long Term Lumen Maintenance of LED Light Sources, TM-21.

J. Institute of Electrical and Electronic Engineers (IEEE): C62.41-91 - Recommended Practice on Surge Voltage in Low Voltage AC Power Circuits

K. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code (NEC)
2. NFPA 101 - Life Safety Code

L. National Electrical Manufacturer’s Association (NEMA):

1. NEMA FA1, - Outdoor Flood Lighting Equipment
2. NEMA SH5, - Tubular Steel, Aluminum and Prestressed Concrete Roadway Lighting Poles
3. NEMA SSL1 - Electronic Drivers for LED Devices, Arrays, or Systems
4. NEMA SSL3- High-Power White LED Binning for General Illumination
5. NEMA SSL7A, - Phase Cut Dimming for Solid State Lighting: Basic Compatibility

M. NEMA 410, - Performance Testing for Lighting Controls and Switching Devices with Electronics

N. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum)

O. Underwriters Laboratories, Inc. (UL):

1. Underwriters Laboratories (UL) Standards

2. Underwriters Laboratories (UL) Standard for Class 2 Power Units
3. Underwriters Laboratories Safety Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products, UL 8750
4. UL 1310 - UL Standard for Safety Class 2 Power Units
5. UL 1598 - Luminaries
6. UL 924 - Standard for Emergency Lighting and Power Equipment

1.6 ACRONYMS AND DEFINITIONS

A. CCT: Correlated color temperature

B. CRI: Color Rendering Index. A measure of the degree of color shift that objects undergo when illuminated by a lamp, compared with those same objects when illuminated by a reference source of comparable correlated color temperature (CCT)

C. CU: Coefficient of Utilization

D. IECC: International Energy Conservation Code

E. LER: Luminaire efficacy rating, which is calculated according to NEMA LE 5.

F. Lumen: Delivered output of luminaire.

G. Light Fixture (Luminaire): Complete lighting unit consisting of a lamp(s) and driver(s)/ballast(s) (when applicable) together with the parts designed to distribute the light, to position and protect the lamp(s), and to connect the lamps to the power supply.

H. NRTL: Nationally Recognized Testing Laboratory

I. Pole: Luminaire support structure.

J. SPD: Surge Protection Device

K. RCR: Room Cavity Ratio

L. UL: Underwriters Laboratory

M. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.

N. Total harmonic distortion (THD) is the root mean square (RMS) of all the harmonic components divided by the total fundamental current.

O. Pole: Luminaire support structure, including tower used for large area illumination.

P. Standard: Same definition as "Pole" above.

1.7 EQUAL MANUFACTURERS

A. Manufacturers listed as “Equal” to the Basis of Design on the light fixture schedule shall submit product cutsheets to the Engineer ten (10) days prior to bid for final written approval. This written approval will only be issued in addendum form. “Equal” fixtures shall be of equal or better quality and performance to the fixture(s) listed with manufacturer’s model numbers. Burden of proof shall be on the Contractor, Vendor, and manufacturer.

B. Upon request, Contractor shall submit manufacturer’s computerized horizontal illumination levels using AGI32 software in foot-candles, taken every ten (10) feet for the entire site. Include average maintained foot-candle levels and maximum and minimum ratio.

1.8 SUBMITTALS

A. Submittal data shall be in accordance with Division 01 Submittal Specification Section, IECC and as specified herein.

B. Eight (8) copies of light fixture factory shop drawings and cuts, showing fixture dimensions, photometric data and installation data shall be submitted to the Engineer for review 15 days after project award date. (Verify shop drawing quantities with the Architect.)

C. Data, drawings, and reports shall employ the terminology, classifications and methods prescribed by IESNA HB-10, as applicable, for the lighting system specified.

D. When catalog data and/or shop drawings for luminaires are submitted for approval, photometric data from an independent testing laboratory or one participating in the NIST National Voluntary Laboratory Accreditation Program (NVLAP) shall be included with the submittal, indicating average brightness and efficiency of the luminaire specified in specification or as shown on the drawings.

E. Product data lacking sufficient detail to indicate compliance with contract documents will be rejected.

F. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture, including dimensions.
2. Emergency lighting units including battery and charger.
3. All available finishes and colors for each luminaire type shall be submitted to the Architect for selection during review.
4. Life, output (lumens, CCT, and CRI), and energy-efficiency data for light fixtures.
5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
6. Dimensions, effective projected area (EPA), accessories, installation details and construction details.
7. Poles: Include dimensions, wind load determined in accordance with AASHTO, pole deflection, pole class, and other applicable information.
8. Distribution data according to IESNA classification type as defined in IESNA HB-10.
9. Amount of shielding on luminaires.

G. Shop Drawings: Including plans, elevations, sections, details, and attachment to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each filed connection.
2. Anchor-bolt templates keyed to specific poles and certified by manufacturer.

H. Pole and Support Component Certification Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-5 and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations by a professional engineer.

1.9 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals.

1.10 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and

advisory provisions of NFPA 70 and NEMA unless more stringent requirements are specified or indicated.

D. Where groups of luminaire types exhibit the same list of acceptable Manufacturers, such as downlights, accents, and wall washers, the intent is to have a final installation with the same Manufacturer’s equipment across the groupings as specified for consistency of optics, aesthetics, and similarity of maintenance procedures. Mixing/matching across groups is unacceptable. This also applies to multi-phased projects with single or multiple, but related luminaire types exhibiting the same list of acceptable Manufacturers, except where products have subsequently been discontinued or significantly redesigned in size, appearance, lamping, or gear.

E. Comply with IEEE C2, "National Electrical Safety Code."

F. Comply with NFPA 70.

1.11 COORDINATION: Coordinate layout and installation of lighting fixtures with all other construction including geothermal well field, sanitary, storm and domestic water.

1.12 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. The Contractor shall provide, receive, unload, uncrate, store, protect and install lamps, luminaires, and auxiliary equipment, as specified herein, in accordance with respective manufacturers' project conditions of temperature and humidity and with appropriate protection against dust and dirt. Lamps for miscellaneous equipment shall be provided and installed by the Contractor according to equipment manufacturers’ guidelines. All products shall be stored in manufacturer's unopened packaging until ready for installation.

C. Luminaire Poles: Do not store poles on ground. Support poles so they are at least one foot above ground level and growing vegetation. Support poles to prevent distortion and arrange to provide free air circulation. Do not remove factory-applied pole wrappings until just before installing pole.

D. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.13 EXTRA MATERIALS

A. Furnish the following extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing content:

1. LED Drivers: One (1) for every fifty (50) of each type and rating installed. Furnish at least five (5) of each type.
2. LED Lamps/Boards: One (1) for every fifty (50) of each type and rating installed. Furnish at least five (5) of each type.

1.14 WARRANTY

A. The equipment items shall be supported by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

B. All luminaries, finishes, poles and all of its component parts, workmanship, and controls shall have an unconditional five (5) year on-site replacement warranty. Warranty shall include all light fixtures, lamps, drivers, poles, finishes and all components to be free from defects in materials and workmanship for a period of five (5) years from date of Owner’s acceptance. On-site replacement includes transportation, removal, and installation of new products. Replacement of luminaries, faulty materials, and the cost of labor to make the replacement shall be the responsibility of the Contractor.

C. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

D. LED drivers: The warranty period shall not be less than ten (10) years from the date of substantial completion. The warranty shall state the malfunctioning LED driver shall be exchanged by the manufacturer and promptly shipped to the Owner. The replacement LED driver shall be identical to, or an improvement upon, the original design of the malfunctioning LED driver.

E. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
2. Warranty Period for Color Retention: Five years from date of Substantial Completion.
3. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide one of the approved products indicated on the Light Fixture Schedule.

B. Subject to compliance with requirements, provide one of the products indicated on Light Fixture Schedule. Refer to Light Fixture Schedule for manufacturers and model numbers. Basis of Design for each light fixture type shall be the first fixture manufacturer and model number for each type listed. Refer to Specification Section 260500, paragraph EQUAL MANUFACTURERS for additional requirements.

C. Manufacturer’s catalog numbers together with the descriptions on the drawings and these specifications are indicative of required design, appearance, quality, and performance. Refer any discrepancies between any of these to the Engineer for resolution prior to bid. In absence of such notice to the Engineer, provide the greater requirement as directed by the Engineer, without additional cost.

D. All luminaires shall be DLC (Design Lights Consortium) Certified.

E. The lighting equipment specified herein has been carefully chosen for its ability to meet the luminous environment requirements of this project. Calculations (with AGi32 or other such software) are generally performed to determine luminance, luminance ratios, and horizontal and vertical illuminances and respective ratios and to assess glare and reflected glare. In some instances, virtual reality “images” have been generated (with AGi32 or other such software) to assist the Lighting Designer, the Architect and/or the Owner in assessing the lighting quality of the space(s). Equipment and/or manufacturers which have been shown to comply with established criteria, including ASHRAE/IES 90.1 and IES guidelines and normal-power lighting requirements as applicable by ordinance, code, Federal law, mandate, or directive, and/or intended LEED certification or other building-rating system, and other lighting standards as deemed appropriate for this specific project is specified herein.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES AND COMPONENTS

A. Comply with the requirements specified in the Articles below and the Light Fixture Schedule.

B. Complete luminaires shall be in accordance with NFPA 70, NEMA, and UL 1598 listed and labeled.

C. Provide luminaires complete with lamps of number, type, and wattage indicated.

D. Ballasts, drivers, or transformers, unless otherwise specified, shall be field replaceable and shall be serviceable while the fixture is in its normally installed position, and shall not be mounted to removable reflectors or wireway covers unless so specified.

E. Unless otherwise specified, a dedicated means of connecting light source to power shall be used in all luminaires unless otherwise specified and shall meet all UL requirements. LED modules shall be field replaceable.

F. Luminaires shall be entirely factory wired by the luminaire manufacturer in accordance with code and UL requirements and shall be furnished fully compatible with the project electrical wiring and controls system for smooth, continuous, dimming or on/off flicker-free operation.

G. Provide in-line fuse-holders with fuses sized per manufacturer's recommendation for each fixture.

H. Exterior light fixtures shall be UL classified for wet location and shall be complete with gaskets and grounding. All dissimilar metal materials shall be separated by non-conductive materials to prevent galvanic action.

I. Provide all luminaires with a specific means for grounding their metallic wireways and housings to an equipment grounding conductor and ground accordingly upon installation.

J. Doors, frames, and other internal access: Smooth operating, free of light leakage under operating conditions. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidently during maintenance and when secured during operating position.

K. All light fixtures shall be completely wired at the factory in accordance with applicable codes and UL.

L. Provide "maximum wattage label" on all light fixture based on the specified maximum wattage indicated on the light fixture schedule.

M. Metal parts: Free of burrs, sharp corners, and sharp edges.

N. Unless otherwise specified, luminaire closures (lens doors, trim frame, hinged housings, etc.) shall be retained in a secure manner by captive screws, chains, captive hinges, or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.

O. Unless otherwise specified, luminaires with louvers or light transmitting panels shall have hinges, latches, and safety catches to facilitate safe, convenient cleaning and relamping. Vapor tight luminaires shall have pressure clamping devices in lieu of the latches.

P. Yokes, brackets, and supplementary supporting members necessary for mounting lighting equipment shall be furnished and installed by the Contractor and approved by the Architect. All materials, accessories, and any other equipment necessary for the complete and proper installation of luminaires, lamps, ballasts/neon transformers included in the contract shall be furnished and installed by the Contractor. All yokes, brackets and supplementary supports shall provide a neat, square, plumb, and level appearance, and shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with all lamps, globes, lenses, lens frames or doors etc. in place.

Q. All connections shall be fixed rigid by screws, rivets and/or soldering. Screws and rivets shall not be visible except as necessary for maintenance and/or aesthetic appearance. Soldering shall be ground smooth to a clean, contiguous surface. All connections shall provide a neat, square, plumb, and level appearance, and shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with lamps, globes, lenses, lens frames or doors etc. in place.

R. All metal work shall be free from tool marks and dents and shall have accurate angles bent as sharp as compatible with the gauges of the required metal and the luminaire styling. All intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion after assembly.

S. For steel and aluminum luminaires, all screws, bolts, nuts and other fastening and latching hardware shall be a cadmium or equivalent plated. For stainless steel luminaires, all hardware shall be stainless steel. For all bronze luminaires, all hardware shall be bronze.

T. Extruded aluminum frames and trims shall be rigid and manufactured from quality aluminum without blemishes in the installed product. Miter cuts shall be accurate; joints shall be flush and without burrs and cut alignment maintained with the luminaire located in its final position.

U. Luminaires shall be suitably gasketed and vented according to manufacturer's instructions. All dissimilar metal materials shall be separated by non-conductive materials to prevent galvanic action.

V. Product procurement and coordination: Contractor shall:

1. Order products according to application
2. Confirm the proper and complete catalog number with distributor and agent.
3. Ensure wiring, driver, etc. meets the specifications and proper requirements.
4. Provide additional parts and pieces required to complete the installation in the location and manner intended by the design.

W. Each light fixture shall be packaged with complete instructions and illustrations on how to install.

X. Each light fixture box, container, etc. shall be labeled at the factory with the type designation as indicated on the Light Fixture Schedule.

2.3 LUMINAIRE REFLECTORS AND TRIMS

A. Alzak cones, reflectors, baffles, and louvers shall be warranted against discoloration.

B. All cones, reflectors, baffles, and louvers shall be removable for lamp access and luminaire cleaning; however, they must otherwise be positively and securely held in-place.

2.4 LIGHT EMITTING DIODE (LED) ELECTRONIC DRIVERS: The electronic driver shall at a minimum meet the following characteristics:

A. LED drivers shall comply with NEMA SSL 1, NFPA 70, and UL 8750 unless otherwise specified.

B. All LED luminaires shall use drivers integral to luminaires or as otherwise required by the luminaire manufacturer.

C. Driver shall comply with UL 1310 Class 1 requirements for wet locations, NFPA 70 unless specified otherwise. Drives shall be designed for the wattage of the LEDs used in the indicated application. Drivers shall be designed to operate on the voltage system to which they are connected.

D. LED driver shall withstand up to a 1,000-volt surge without impairment of performance as defined by ANSI C62.41 Category A.

E. Operating temperature rating shall be between -40°F and 120°F.

F. Provide with integral 10kV surge suppression protection minimum. Surge protection shall be tested in accordance with IEEE/ANSI C62.41.2.

G. LED driver shall tolerate ±10 percent supply voltage fluctuation with no adverse effects to driver or LEDs.

H. LED driver forward voltage (Vf) shall be matched to LED board.

I. LED driver shall exhibit no visible change in light output with a variation of ±10 percent line voltage input.

J. Drivers for luminaires controlled by dimming devices shall be as specified herein and equipped for dimming and conform to the recommendations of the manufacturer of the associated dimming devices to assure satisfactory operation of the lighting system. Contractor shall coordinate all wiring infrastructure to accommodate final-selected drivers and controls systems for smooth, continuous, and flicker-free operation.

K. Flicker: The flicker shall be less than 5 percent at all frequencies below 1000 Hz and without visible flicker. Drivers shall meet or exceed NEMA 410 driver inrush standard.

L. Power factor shall be 0.95 (minimum).

M. Class A Sound Rating.

N. Current crest Factor of 1.5 or less.

O. LED driver total harmonic distortion (THD) shall be less than 20 percent for drivers unless otherwise specified. For dimming drivers, THD shall at no point in the dimming curve allow imbalance current to exceed full output THD.

P. All LED luminaires shall be fused on the primary side of the driver as recommended by the respective luminaire manufacturers.

Q. All LED drivers shall be suitably sized to accommodate the LED array consistent with industry standards, including IEC standard 60929 Annex E.

2.5 LIGHT EMITTING DIODE (LED): The light emitting diodes shall as a minimum meet the following characteristic:

A. LED modules shall be manufactured by Cree, GE, Philips, Osram, Niche, or Xicato.

B. LED lamps shall comply with ANSI C78.1.

C. Chromacity of LED lamps shall comply with ANSI C78.377A and NEMA SSL-3.

D. Light emitting diodes shall be tested under IES LM-80 standards.

E. Color Rendering Index (CRI) shall be 84 (minimum).

F. Color temperature of 4,000K, or as indicated on light fixture schedule.

G. Rated lumen maintenance of 90% lumen output at 50,000 hours (minimum).

H. Rated lumen maintenance of 70% lumen output at 100,000 hours (minimum).

I. For color consistency, lamp maintenance consistency and for light output consistency, mixed lamps of the same lamp type from different manufacturers is unacceptable. Use the same brand and date code for all lamps except as otherwise specified. Contractor shall be responsible for coordinating all lamps and brand among all luminaire Vendor(s) and Contractor's respective distributor(s).

2.6 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.

1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.

2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.3 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete."

F. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4-M.

2.7 POLES

A. Provide poles designed for wind loading of 120 miles per hour determined in accordance with AASHTO LTS-5 while supporting luminaires and all other appurtenances indicated. The effective projected areas of luminaires and appurtenances used in calculations shall be specific for the actual products provided on each pole. Poles shall be anchor-base type designed for use with underground supply conductors. Poles shall have oval-shaped handhole having a minimum clear opening of 2.5 by 5 inches. Handhole cover shall be secured by stainless steel captive screws. Metal poles shall have an internal grounding connection accessible from the handhole near the bottom of each pole. Scratched, stained, chipped, or dented poles shall not be installed.

2.8 STEEL POLES

A. Steel Poles: Provide square steel poles having a minimum 11-gage steel with minimum yield/strength of 48,000 psi and hot-dipped galvanized in accordance with ASTM A123/A123M factory finish. Provide a pole grounding connection designed to prevent electrolysis when used with copper ground wire. Pole shall be anchor bolt mounted type. Pole shafts shall be one piece. Poles shall be welded construction with no bolts, rivets, or other means of fastening. Joint between shaft and base shall be welded. Pole markings shall be approximately 3 to 4 feet above grade and shall include manufacturer, year of manufacture, top and bottom diameters, and length. Base cover shall be cast 356-T6 aluminum alloy in accordance with ASTM B108/B108M.

B. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig; one-piece construction up to 40 feet in height with access handhole in pole wall.

1. Shape: Square, straight.
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

C. Brackets for Luminaires: Detachable, cantilever, without underbrace.

1. Adapter fitting welded to pole, allowing the bracket to be bolted to the pole mounted adapter, then bolted together with stainless steel bolts.
2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
3. Match pole material and finish.

D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

E. Steps: Fixed steel, with nonslip treads, positioned for 15-inch vertical spacing, alternating on opposite sides of pole; first step at elevation 10 feet above finished grade.

F. Intermediate Handhole and Cable Support: Weathertight, 3-by-5-inch handhole located at midpoint of pole with cover for access to internal welded attachment lug for electric cable support grip.

G. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

H. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.

I. Platform for Lamp and Ballast Servicing: Factory fabricated of steel with finish matching that of pole.

J. Galvanized Finish: After fabrication, hot-dip galvanize complying with ASTM A 123/A 123M.

2.9 ALUMINUM POLES

A. Aluminum Poles: Seamless, extruded structural tube complying with ASTM B 429/B 429M, Alloy 6063-T6 with access handhole in pole wall. Provide round aluminum poles manufactured of corrosion resistant aluminum alloys conforming to AASHTO LTS-5 for Alloy 6063-T6 or Alloy 6005-T5 for wrought alloys and Alloy 356-T4 (3, 5) for cast alloys. Poles shall be seamless extruded or spun seamless type with minimum 0.188 inch wall thickness. Provide a pole grounding connection designed to prevent electrolysis when used with copper ground wire. Tops of shafts shall be fitted with a round or tapered cover. Base shall be anchor bolt mounted, made of cast 356-T6 aluminum alloy in accordance with ASTM B108/B108M and shall be machined to receive the lower end of shaft. Joint between shaft and base shall be welded. Base cover shall be cast 356-T6 aluminum alloy in accordance with ASTM B108/B108M. Hardware, except anchor bolts, shall be either 2024-T4 anodized aluminum alloy or stainless steel. Manufacturer's standard provision shall be made for protecting the finish during shipment and installation. Minimum protection shall consist of spirally wrapping each pole shaft with protective paper secured with tape and shipping small parts in boxes.

B. Poles: Poles: ASTM B 209 (ASTM B 209M), 5052-H34 marine sheet alloy with access handhole in pole wall.

1. Shape: Round, straight
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

D. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

E. Brackets for Luminaires: Detachable, with pole and adapter fittings of cast aluminum. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.

1. Tapered oval cross section, with straight tubular end section to accommodate luminaire.
2. Finish: Same as luminaire.

2.10 BRACKETS AND SUPPORTS

A. ANSI C136.3, ANSI C136.13, and ANSI C136.21, as applicable. Pole brackets shall be not less than 1-1/4 inch secured to pole. Slip-fitter or pipe-threaded brackets may be used, but brackets shall be coordinated to luminaires provided, and brackets for use with one type of luminaire shall be identical. Brackets for pole-mounted street lights shall correctly position luminaire no lower than mounting height indicated. Mount brackets not less than 24 feet above street. Special mountings or brackets shall be as indicated and shall be of metal which will not promote galvanic reaction with luminaire head.

2.11 POLE FOUNDATIONS

A. Anchor bolts shall be steel rod having minimum yield strength of 50,000 psi and shall be galvanized in accordance with ASTM A153/A153M. Concrete shall be as specified in Division 03 Specification Section, CAST-IN-PLACE CONCRETE.

2.12 FUSING: All luminaires shall be fused. Fuse pole mounted fixtures at handhole.

2.13 POLE ACCESSORIES

A. Duplex Receptacle: 120 V, 20 A in a weatherproof assembly complying with Division 26 Section "Wiring Devices" for ground-fault circuit-interrupter type.

1. Recessed, 12 inches above finished grade.
2. Nonmetallic polycarbonate plastic or reinforced fiberglass, weatherproof in use, cover, color to match pole, that when mounted results in NEMA 250, Type 4X enclosure.
3. With cord opening.
4. With lockable hasp and latch that complies with OSHA lockout and tag-out requirements.

2.14 EQUIPMENT IDENTIFICATION

A. Manufacturer's Nameplate: Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

B. Factory-Applied Labels: Provide labeled luminaires in accordance with UL 1598 requirements. All light fixtures shall be clearly marked for operation of specific LED’s and drivers according to proper type. The following characteristics shall be noted in the format "Use Only _____":

1. LED or lamp type, and nominal wattage
2. Driver or ballast type
3. Correlated color temperature (CCT) and color rendering index (CRI)
4. All markings related to lamp type shall be clear and located to be readily visible to service personnel, but unseen from normal viewing angles when lamps are in place. Drivers and ballasts shall have clear markings indicating multi-level outputs and indicate proper terminals for the various outputs.

2.15 FACTORY APPLIED FINISH: Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install luminaires in accordance with luminaire manufacturer’s written instructions, applicable requirements of NEC, NECA’s “Standard of Installation”, and NEMA standards.

B. Electrical installations shall conform to and meet IEEE C2, NFPA 70, and to the requirements specified herein.

C. Do not scale plans for exact location of lighting fixtures.

D. Set luminaires plumb, square, and level in alignment with adjacent luminaires, and secure in accordance with manufacturers' directions and approved drawings.

E. Utilize weatherproof silicone filled wire nuts and seal all junction boxes and conduit with potting compound to create waterproof barriers. Inspect all splices and fixtures for continuity prior to potting.

F. Lubricate all threaded parts with a high temperature waterproof anti-seize lubricant, including lamp bases and sockets, to prevent seizing and corrosion.

3.2 POLE INSTALLATION

A. Poles: Provide pole foundations with galvanized steel anchor bolts, threaded at the top end, and bent 90 degrees at the bottom end. Provide ornamental covers to match pole and galvanized nuts and washers for anchor bolts. Thoroughly compact backfill with compacting arranged to prevent pressure between conductor, jacket, or sheath and the end of conduit ell. Adjust poles as necessary to provide a permanent vertical position with the bracket arm in proper position for luminaire location. Install according to pole manufacturer's instructions. Alterations to poles after fabrication will void manufacturer's warranty and shall not be allowed

B. Excavation: Restrict excavation in size to that which will provide sufficient working space for installation of concrete forms. Should soil conditions at the bottom of the excavation be unsuitable as a foundation, as determined by the Architect, take the excavation down to firm soil and fill to required grade with concrete or satisfactory soil materials as directed. Perform excavations in a manner to prevent surface, subsurface, and ground water from flowing into the excavation. Use pumps or other dewatering methods necessary to convey the water away from the excavation work below ground-water level.

C. Formwork: Construct forms of wood, plywood, steel, or other acceptable materials fabricated to conform to the configuration, line, and grade required. Reinforce formwork to prevent deformation while concrete is being placed and consolidated. Wet or coat formwork with a parting agent before placing concrete.

D. Concrete Pole Foundations: Set anchor bolts with exposed threaded ends vertically positioned in the concrete using a template supplied by pole manufacturer in accordance with the lighting standard manufacturer's recommendations. Concrete materials, installation, and finishing requirements are specified in Division 03 Section "Cast-in-Place Concrete."

E. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

F. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:

1. Fire Hydrants and Storm Drainage Piping: 60 inches
2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet
3. Trees: 15 feet from tree trunk.

G. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level recommended by pole manufacturer.

1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use non-shrink or expanding concrete grout firmly packed to fill space.
3. Install base covers unless otherwise indicated.
4. Use a short piece of 1/2-inch diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

H. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.

1. Dig holes large enough to permit use of tampers in the full depth of hole.
2. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.

I. Embedded Poles with Concrete Backfill: Set poles in augured holes to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.

1. Make holes 6 inches in diameter larger than pole diameter.
2. Fill augured hole around pole with air-entrained concrete having a minimum compressive strength of 3000 psi at 28 days, and finish in a dome above finished grade.
3. Use a short piece of 1/2-inch diameter pipe to make a drain hole through concrete dome. Arrange to drain condensation from interior of pole.
4. Cure concrete a minimum of 72 hours before performing work on pole.

J. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.

K. Raise and set poles using web fabric slings (not chain or cable).

3.3 BOLLARD LUMINAIRE INSTALLATION

A. Align units for optimum directional alignment of light distribution.

B. Install on concrete base with top 4 inches above finished grade or surface at bollard location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Division 03 Section "Cast-in-Place Concrete."

3.4 INSTALLATION OF INDIVIDUAL GROUND-MOUNTING LUMINAIRES

A. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Division 03 Section "Cast-in-Place Concrete."

3.5 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Division 26 Section "Raceway and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.6 GROUNDING

A. Bond luminaires and metal accessories to the grounding system per National Electrical Code.

B. Ground noncurrent-carrying parts of equipment including metal poles, luminaires, mounting arms, brackets, and metallic enclosures. Where copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.

C. At each pole and light bollard, provide a driven ground rod into the earth so that after the installation is complete, the top of the ground rod will be approximately 1 foot below finished grade.

D. Ground metal poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems.

1. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
2. Install grounding electrode for each pole unless otherwise indicated.

E. Ground nonmetallic poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole.
2. Install grounding conductor and conductor protector.
3. Ground metallic components of pole accessories and foundations.

3.7 IDENTIFICATION

A. Light fixtures served from multiple power sources, such as emergency fixtures fed from emergency transfer relay, shall have the following label affixed to it:

1. “DANGER - ELECTRICAL SHOCK HAZARD - LIGHT FIXTURE HAS MULTIPLE POWER SOURCES”

3.8 CLEANING

A. At completion of each phase and the time of final acceptance by the Owner, all lighting fixtures shall have been thoroughly cleaned with materials and methods recommended by the manufacturer.

B. Any lens, louver or cone showing dirt or fingerprints shall be cleaned with solvent recommended by the manufacturer to a like-new condition or replaced as necessary in order to turn over to the Owner new fixtures at beneficial occupancy.

C. All fingerprints, dirt, tar, smudges, mud, dust, etc. shall be removed by the Contractor from the luminaire bodies, poles, reflectors, trims, and lens/louvers prior to final acceptance. All reflectors shall be free of paint other than factory-applied, if any.

3.9 TESTING AND ADJUSTMENT

A. The lighting and lighting controls systems shall be synchronized and fully operable to address the lighting operation in a complete and code-compliant manner.

B. All adjustable luminaires shall be aimed, focused, locked, etc., by the Contractor under the observation of the Architect. As aiming and adjusting is completed, locking setscrews and bolts and nuts shall be tightened securely by the Contractor.

C. Contractor shall coordinate with Architect to establish the number of two-member crews required for aiming and adjusting. All aiming and adjusting shall be performed after the entire installation is complete for each phase or area. The Contractor shall be responsible for notifying the Architect of appropriate time for final luminaire adjustment.

D. All ladders, scaffolds, lifts, gloves, cleaning cloths, access/adjustment tools, etc. required for aiming and adjusting luminaires shall be furnished by the Contractor.

E. Where possible, units shall be focused during the normal working day. However, where daylight interferes with seeing lighting effects, aiming shall be accomplished at night.

3.10 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data in accordance with Division 01 Specification Section, IECC and as specified herein, showing all light fixtures, control devices and all interconnecting control wire, conduit, and associated hardware.

B. Contractor shall be responsible for obtaining from his supplying light fixture manufacturers, for each type of light fixture, a recommended maintenance manual including, tools required, types of cleaners to be used and replacement parts identification list.

C. Provide at least three (3) CDs/DVDs with high resolution PDF files of all equipment product data for Owner's use in equipment identification and maintenance with recommended maintenance manuals including, at a minimum:

1. Vendor and local representative's contact information
2. Tools required
3. Types of cleaners to be used
4. Replacement parts identification lists
5. Equipment product data (high-quality reproducible copies)
6. Warranty documentation

3.11 FIELD QUALITY CONTROL

A. Upon completion of installation, verify that equipment is properly installed, connected, and adjusted. Conduct an operating test to show that equipment operates in accordance with requirements of this section.

B. Dimming Drivers and ballasts. Test for full range of dimming capability. Observe for visually detectable flicker over full dimming range.

C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

D. Inspect each luminaire for damage. Replace damaged luminaires at no cost to the Owner.

E. Fixtures showing dirt, dust or fingerprints shall be restored to like new condition or shall be replaced at no cost.

F. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

G. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

1. Verify operation of photoelectric controls.

H. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):

a. IESNA LM-5, "Photometric Measurements of Area and Sports Lighting Installations."
b. IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
c. IESNA LM-52, "Photometric Measurements of Roadway Sign Installations."
d. IESNA LM-64, "Photometric Measurements of Parking Areas."
e. IESNA LM-72, "Directional Positioning of Photometric Data."

I. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265619

SECTION 270536 – CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section Includes: Ladder cable trays.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cable tray.

1. Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: For each type of cable tray.

1. Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Include scaled cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements.
2. Vertical and horizontal offsets and transitions.
3. Clearances for access above and to side of cable trays.
4. Vertical elevation of cable trays above the floor or below bottom of ceiling structure.

B. Field quality-control reports.

1.5 WARRANTY

A. The equipment items shall be supported by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

B. All cable trays, finishes, and all of its component parts shall have an unconditional one (1) year warranty. Warranty shall include finishes and all components to be free from defects in materials and workmanship for a period of one (1) year from date of Owner’s acceptance. Replacement of cable tray, temporary support of cables, faulty materials, and the cost of labor to make the replacement shall be the responsibility of the Contractor.

C. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to and run

concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

1.6 WARRANTIES

A. INSTALLATION WARRANTY. The Contractor shall warrant cable trays unconditionally against defects in workmanship for a period of one (1) year from the date of system acceptance. The warranty shall cover all labor and materials necessary to correct a failed portion of the system and to demonstrate performance within the original installation specifications after repairs are accomplished. Replacement of faulty materials and the cost of labor to make the replacement shall be the responsibility of the Contractor.

B. The equipment items shall be supported by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

C. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

D. The Contractor shall provide a system warranty covering the installed cabling system against defects in workmanship, components, and performance, and covering follow-on support after project completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR CABLE TRAYS

A. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.

1. Source Limitations: Obtain cable trays and components from single manufacturer.

B. Sizes and Configurations: See the Drawings for specific requirements for sizes, and configurations. Minimum dimensions shall be 12 inches wide and 4 inches deep.

C. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:

1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
3. Load and Safety Factors: Applicable to both side rails and rung capacities.

2.2 LADDER CABLE TRAYS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Mono Systems, Inc., or comparable product by one of the following:

1. Allied Tube & Conduit; a Tyco International Ltd. Co.
2. Chalfant Manufacturing Company.
3. Cooper B-Line, Inc.
4. MP Husky.
5. Niedax-Kleinhuis USA, Inc.
6. US Tray; a United Structural Products Co.

B. Description:

1. Configuration: Two I-beam side rails with transverse rungs welded to side rails.
2. Rung Spacing: 6 inches on center over the entire length of the cable tray.
3. Radius-Fitting Rung Spacing: 9 inches at center of tray's width.
4. Minimum Cable-Bearing Surface for Rungs: 7/8-inch width with radius edges.
5. No portion of the rungs shall protrude below the bottom plane of side rails.
6. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load, when tested according to NEMA VE 1.
7. Minimum Usable Load Depth: 4 inches.
8. Width: 24 inches or as indicated on Drawings.
9. Fitting Minimum Radius: 12 inches.
10. The maximum uniform load and the support span are indicated by the cable tray class.
11. Class Designation: Comply with NEMA VE 1, Class 12C.
12. Splicing Assemblies: Bolted type using serrated flange locknuts.
13. Hardware and Fasteners: Steel, zinc plated according to ASTM B 633.
14. Splice Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

2.3 MATERIALS AND FINISHES

A. Aluminum:

1. Materials: Alloy 6063-T6 according to ANSI H 35.1/H 35.1M for extruded components and Alloy 5052-H32 or Alloy 6061-T6 according to ANSI H 35.1/H 35.1M for fabricated parts.
2. Hardware: Stainless steel, Type 316, ASTM F 593, and ASTM F 594.

2.4 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, radius drops, and other fittings as indicated, of same materials and finishes as cable tray.

B. Barrier Strips: Same materials and finishes as for cable tray.

C. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.5 WARNING SIGNS

A. Lettering: 1-1/2-inch- high, black letters on yellow background with legend "Warning! Not To Be Used as Walkway, Ladder, or Support for Ladders or Personnel." Provide warning sign on 8’ centers on both sides of cable tray.

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

A. Install cable trays according to NEMA VE 2.

B. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

C. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.

D. Remove burrs and sharp edges from cable trays.

E. Join aluminum cable tray with splice plates; use four square neck-carriage bolts and locknuts.

F. Fasten cable tray supports to building structure.

G. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb. In addition, comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems."

H. Place supports to provide clearances shown on Drawings.

I. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze form as required by application.

J. Locate and install supports at each end connection and at mid-span. Support interval shall not exceed 6 feet.

K. Support trapeze angers' trays with 3/8-inch diameter rods.

L. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.

M. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in NEMA VE 2. Space connectors and set gaps according to applicable standard.

N. Make changes in direction and elevation using manufacturer's recommended fittings.

O. Make cable tray connections using manufacturer's recommended fittings.

P. Seal penetrations through fire and smoke barriers. Comply with requirements in Firestopping Specification.

Q. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

R. Cable tray shall have 12" clearance above, 26" to one side, and 6" below. Cable trays shall be the first utility install above the ceiling.

S. Install warning signs in visible locations on or near cable trays after cable tray installation.

3.2 CABLE TRAY GROUNDING

A. Ground cable trays according to TIA/EIA 607 unless additional grounding is specified. Comply with requirements in Section 270526 "Grounding and Bonding for Communications." Bonding conductor shall be a minimum of continuous #2 AWG copper.

B. Cable trays with communications cable shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

C. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

3.3 CABLE INSTALLATION

A. Install cables only when each cable tray run has been completed and inspected.

B. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

C. Fasten cables on vertical runs to cable trays every 18 inches (450 mm).

D. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and

enclosure shall be no more than 72 inches (1800 mm). Factory radius drops shall be used for all transitions in elevation.

3.4 CONNECTIONS

A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.

B. Physically and electrically connect pathways to cable trays per specifications and drawings.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
7. Check for improperly sized or installed bonding jumpers.
8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 0.5 ohms.

B. Prepare test and inspection reports.

3.6 PROTECTION

A. Protect installed cable trays and cables.

1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION 270536

SECTION 270538 – NON-CONTINUOUS CABLE SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. All layout and installation of communications infrastructure shall be in accordance with ANSI / TIA 568 and the BICSI TDMM.

D. Each Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section Includes: J-hook pathways.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of J-hook.

1. Include data indicating dimensions and finishes for each type of J-hook indicated.

B. Shop Drawings: For each type of J-hook.

1. Show fabrication and installation details of tiered J-hook assemblies, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, and fittings.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Include scaled J-hook layouts and relationships between components and adjacent structural, electrical, and mechanical elements.
2. Vertical and horizontal offsets and transitions.
3. Clearances for access above and to side of J-hook cabling pathways.
4. Vertical elevation of J-hook pathways above the floor or below bottom of ceiling structure.

B. Field quality-control reports.

1.5 WARRANTIES

A. INSTALLATION WARRANTY. The Contractor shall warrant J-hooks unconditionally against defects in workmanship for a period of one (1) year from the date of system acceptance. The warranty shall cover all labor and materials necessary to correct a failed portion of the system and to demonstrate performance within the original installation specifications after repairs are accomplished. Replacement of faulty materials and the cost of labor to make the replacement shall be the responsibility of the Contractor.

B. The equipment items shall be supported by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render

satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

C. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

D. The Contractor shall provide a system warranty covering the installed cabling system against defects in workmanship, components, and performance, and covering follow-on support after project completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR J-HOOKS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Panduit “J-Pro”

B. Patented design provides complete horizontal and vertical 1" bend radius control that helps prevent degradation of cable performance.

C. UL 2043 and CAN/ULC S102.2 listed and suitable for use in air handling spaces.

D. Pre-riveted assemblies allow for attachment to walls, ceilings, beams, threaded rods, drop wires and underfloor supports to meet requirements of a variety of applications.

E. Wide cable support base prevents pinch points that could cause damage to cables.

F. Cable tie channel allows user to easily install 3/4" (19.1mm) Tak-Ty ® Cable Ties to retain cable bundle.

G. Durable non-metallic J-Hook materials provide the ability to manage and support a large number of cables.

H. Material: Black Nylon 6.6 J-Hook with metal attachments.

PART 3 - EXECUTION

3.1 J-HOOK INSTALLATION

A. Cable J-hook spacing maximum 4 feet on center. Maximum 2 feet on center for Data cabling.

B. Data cabling cannot be shared with any other type of cable or wires. Provide tiered J-hooks paths as required.

C. Cables cannot lay on ceiling tiles or other systems.

D. Do not exceed load ratings specified by manufacturer.

E. Do not fill cable hook greater than manufactures recommended guidelines. Installation and configuration shall conform to the requirements of the current revision levels of ANSI/ EIA/TIA Standards 568 & 569, NFPA 70 (National Electrical Code), applicable local codes, and to the manufacturer’s installation instructions.

F. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by manufacturer or by TIA 568.

G. Do not install J-hooks that cannot be maintained without removal of another system.

3.2 CABLE INSTALLATION

A. Refer to specification 270610 for additional requirements.

B. Install cables only when each J-hook run has been completed and inspected.

C. Install cables without damaging conductors, shield, or jacket.

D. Install cables using techniques, practices, and methods that are consistent with Category 5e or higher requirements and that supports Category 5e or higher performance of completed and linked signal paths, end to end.

E. Pull cables without exceeding cable manufacturer's recommended pulling tensions or outlined in TIA 569. Use pulling means that will not damage media.

3.3 CONNECTIONS

A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.

B. Physically and electrically connect pathways to cable trays per specifications and drawings.

3.4 PROTECTION

A. Protect installed J-hooks and cables.

1. Install temporary protection for cables in open J-hooks to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and J-hooks can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.

END OF SECTION 270538

SECTION 270600 - INTERCOMMUNICATION & CLASS CHANGE SIGNALING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. All layout and installation of communications infrastructure shall be in accordance with ANSI / TIA 568 and the BICSI TDMM.

D. Each Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SCOPE OF WORK

A. All bids shall be based on the materials and equipment as specified herein and as indicated on the drawings. The basis of design for the OFOI intercom head-end is BOGEN QUANTUM.

B. The low-voltage installation contractor will be referred to here after as the “contractor” or “installation contractor”.

C. Contractor shall furnish all new speakers, speaker wire and other associated equipment, accessories, materials as listed, in accordance with these specifications and drawings, unless otherwise specified.

D. All shields must be properly terminated and grounded at each end. All cables must be permanently labeled with final room numbers.

E. Each room speaker must be on a separate zone. Each major corridor must be on a separate zone.

F. Provide weatherproof speakers on separate zones, located around the perimeter of the building as indicated on drawings. Install in inconspicuous positions below building soffits.

G. All zoning must be submitted and approved by Warren County Public Schools (WCPS) prior to rough-in/implementation.

H. Do not splice intercom or telephone wiring unless absolutely unavoidable and then only with insulated compression connectors, not with wire nuts. Shields must be electrically continuous. J-boxes shall be sized in accord with NEC 370.

I. Final room numbers selected by the Owner shall be used as telephone numbers and to label console and cables.

J. Tap each classroom speaker at 1/4 watt

K. Tap each hallway speaker at 1/2 watt

L. Tap each exterior speaker at 3.8 watts

M. Tap each cafeteria speaker at 1 or 1.25 watts

N. Tap each interior horn speakers at 0.5 to 1 watt

O. Each card has 24 ports, and each card can handle 10 watts

P. 1 card will be the "Amplified card" and can handle based on the amplifier that is put in.

Q. Daisy chain no more than 10 speakers in a zone.

R. Each 66 block shall be white with white plastic cover. Architectural number to be wire labeled on wire and also on the Plastic cover

S. The communication system supplied shall be listed by Underwriter's Laboratories under UL Standard 1459. A copy of the UL listing card for the proposed system shall be included with the contractor's submittal.

T. Provide lightning protection (surge protection) on all outdoor speakers.

1.3 SINGLE SOURCE RESPONSIBILITY AND OBSOLETE EQUIPMENT

A. Except where specifically noted otherwise, all equipment supplied by the contractor shall be the standard product of a single manufacturer of known reputation and experience in the industry. Only equipment, components, and accessories in current production for at least five years beyond the completion date of this system shall be used and installed. Any equipment found to be obsolete or not in future production will be removed and replaced at contractor's expense.

1.4 CONTRACTOR QUALIFICATIONS AND QUALITY ASSURANCE

A. The installation contractor shall be an established communications and electronics contractor that has had and currently maintains a locally run and operated business for at least five years. Further this contractor shall have a minimum of 5 years' experience in the specific installation and application of intercommunications and class change signaling systems, i.e.: school intercom systems.

B. The installation contractor shall show satisfactory evidence, upon request, that it maintains a fully equipped service organization capable of furnishing adequate inspection and service to the equipment and materials installed.

1.5 APPROVED EQUIPMENT

A. Bids must be submitted on the basis of the specified materials and manufactures or equal. Alternative materials and manufacturers must be approved as an equal by the engineer and the WCPS Electronic Maintenance Department and listed in an addendum to these specifications.

B. WCPS reserves the right to determine "or equal".

C. Reference the paragraphs under "SUBSTITUTE EQUIPMENT PREQUALIFICATION" for the requirements to approve alternative systems.

1.6 SUBSTITUTE EQUIPMENT PREQUALIFICATION

A. Proposals for substitute or alternative manufactures, components, materials, and /or equipment must be received no later than seven (7) working days prior to bid opening date. These proposals shall include the following:

1. An index list showing the model and manufacturer of equipment installed in a facility, names of references at that facility, and approximate contract amount, where said equipment has been installed and business phone numbers of the contractor/supplier's principal owners.
2. A complete index of models and manufacturers for equipment and materials proposed for this project. Complete engineering data, catalog information, wiring, warranty information that states all components covered and length of warranty and connection diagrams and system layout drawings shall be included with this index.

B. NOTE: The Owner and Engineer shall be under no obligation to pre-qualify additional (substitute) equipment and / or manufacturers. However, if such pre-qualification is granted, it must be done in addendum form no later than four (4) days prior to bid opening date, thus informing all contractors that the submitted substitute equipment is now ALTERNATE EQUIPMENT and will be considered for this project. Approval granted for such substitute manufactures, components, materials, and /or equipment is only an initial approval and does not relieve the contractor of furnishing components, materials, and /or equipment that complies with or exceeds the performance and quality as

specified. Final approval of the alternate equipment shall be determined at the time of job completion. Failure to provide the “precise functional equivalent” shall result in the removal of the alternate equipment and replacement with the specified equipment at the contractor’s expense.

1.7 DRAWINGS

A. The contractor, at the substantial completion date of this work shall, furnish a complete professional set of “as-built” drawings showing the routing of all wires and termination points at both ends of the cabling and what color wires that were used that are connected to the speaker and call-in switch.

1.8 WARRANTY AND SERVICE

A. The contractor shall provide a one-year warranty covering the installation and materials provided by the contractor. All labor, trip charges and materials shall be provided at no expense to the owner during this one-year period. The warranty period shall begin on the date of the projects’ substantial completion unless it is determined the installation was not acceptable by the Owner/Engineer on that date.

1.9 SUBMITTALS

A. Equipment Data Sheets (EDS) shall be submitted on all components and materials provided by the contractor including cable types.

B. Submit outline drawing of system control cabinet showing relative position of all major components.

C. Submit wiring diagrams showing typical connections for all equipment.

D. Submit a certificate of completion of installation and service training from the system manufacturer.

E. The UL listing card and other documents verifying compliance with to UL/CSA 60065 and FCC Standard C108.8 shall be submitted for equipment supplied by the contractor where applicable.

1.10 SERVICE AND MAINTENANCE

A. The contractor shall provide a one-year warranty of the installed system against defects in material and workmanship. All labor and materials shall be provided at no expense to the owner during normal working hours. The warranty period shall begin on the date of acceptance by the Owner/Engineer.

B. The contractor shall, at the owner's request, make available a service contract offering continuing factory authorized service of this system after the initial warranty period.

C. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

1.11 QUALITY ASSURANCE

A. All items of equipment including wire and cable shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.

B. The contractor shall be an established communications and electronics contractor that has had and currently maintains a locally run and operated business for at least five years. The contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges. Written proof of distributorship shall be required if requested by the engineer.

C. The contractor shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The contractor shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

PART 2 – GENERAL

2.1 BASIS OF DESIGN

A. The equipment model number specified herein, which will be provided, installed, and programmed by WCPS, was used as the basis of design, is BOGAN QUANTUM. This equipment was used in the design to establish a standard of quality, function, and features.

B. It is the responsibility of the Contractor to ensure that the products furnished and installed by the contractor strictly meet or exceed every standard set forth in these specifications.

C. The contractor must have 5 years previous experience at installing intercommunications and class change signaling systems, i.e.: school intercom systems and must provide proof of previous experience and provide references, if requested, to the WCPS project manager or engineer.

2.2 SPEAKER WIRES (CFCI)

A. Contractor shall provide all intercom speaker wiring to the MDF Room Intercom Rack, as indicated on the drawings, from each speaker location to MDF Room. At each end of the wire, Contractor shall mark with Brady tags with each room location or room number it is connected to.

B. All cable shall be as manufactured by Commscope, Belden or West Penn. Intercommunication system cable shall not share conduit with any other system. All cable shall be Plenum rated.

C. Terminate all speakers wires in MDF Room on 66 blocks.

2.3 SPEAKERS (CFCI)

A. Classroom/Hallway Speaker Assembly: Quam System 12 (or equal) complete loudspeaker assembly with an 8" O.D., full range loudspeaker, multiple transformer options, perforated steel baffle, and integral molded fiber enclosure. Transformer Options: 5W-25/70.7V pigtail, 5W-25/70.7V pigtail with Volume Control, 4W-25V rotary select. Finish: White baked epoxy hybrid.

B. Media Center/Office/Restroom Volume Control Speaker Assembly: Quam System 12/VC (or equal) complete loudspeaker assembly with an 8" O.D., full range loudspeaker, multiple transformer options, perforated steel baffle, and integral molded fiber enclosure. Transformer Options: 5W-25/70.7V pigtail, 5W-25/70.7V pigtail with Volume Control, 4W-25V rotary select or 4W-70.7V rotary select. Finish: White baked epoxy hybrid.

C. Wall Mounted Volume Control Speaker Assembly: Quam 3/VC (or equal) speaker enclosure. (for locations without a suspended ceiling)

D. Wall Mounted, Sloped Gym Speaker Assembly: Quam 2VP (or equal) Vandal-proof speaker enclosure.

E. Exterior Speaker: Quam 6VP (or equal) Vandal-proof speaker enclosure. Speaker baffle enclosure and face-plate grille to be field painted color selected by Architect.

F. Horn Speaker: Atlas Horn GA-15T (or equal) 15 Watt Paging Horn or approved equal with built-in 25 volt and 70 volt multi tap transformer with selector switch.

PART 3 – EXECUTION

3.1 INTERCOM ZONES

A. One zone for each classroom speaker(s).
B. One zone for gymnasium speakers.
C. One zone for cafeteria speakers.
D. One zone for corridor speakers.
E. One zone for common areas.
F. One zone for administrative areas.
G. One zone for teachers' lounge and workrooms.
H. One zone for outside speakers.
I. One zone for outside at pre-school classrooms

3.2 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. Terminate all conductors; no cable shall contain un-terminated elements. Make terminations only at outlets and terminals.

C. All cables shall be concealed by all means possible unless shown otherwise on the drawings. Cables concealed within walls shall be installed in electrical metallic tubing (EMT). Cables concealed above suspended ceilings shall be installed in “J” hooks.

D. All speaker cables shall be twisted shielded pair, low capacitance, size as required, 100% shield coverage, plenum rated.

E. Note: It is the responsibility of the contractor tap the speakers as indicated above when connecting the intercom speaker wires.

F. All intercommunications system cable runs are to be installed in a neat and clean fashion and shall not rest directly on ceiling tiles, lamp fixtures, etc. Support from any piping/ductwork/ steel structure is strictly prohibited.

G. All intercommunications system cabling shall be supported by separate 2” j-hooks spaced a maximum of every 4’. Conduit pathways traversing across hard surfaced ceiling spaces are provided by the EC under the base contract. Contractor shall review pathways as shown on plan and coordinate any adjustments before rough-in.

H. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.

I. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

J. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

K. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

L. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not

be used for heating

M. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, “Pulling Cable.” Monitor cable pull tensions.

N. Install cabling with horizontal and vertical cable guides in telecommunication spaces with terminating hardware and interconnection equipment.

O. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.

P. Separation: Sound and voice cables shall be separated from power as follows: 6” from light fixtures, 12” from power conduits and minimum 48” from motors/ transformers.

Q. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.

3.3 INSTALLATION

A. A licensed electrical contractor may install “J” Hooks and raceways, but in no case connect and/or install any devices. This must be done by the personnel indicated under the CONTRACTOR QUALIFICATIONS AND QUALITY ASSURANCE Section.

B. Speakers that are located in restrooms are to be tied to the hallway speakers.

C. Speakers located in small rooms or offices shall be equipped with a volume control recessed in the speaker.

D. Storage rooms and offices located inside classrooms shall have their speakers tied to the speaker within the room they are located.

E. Special Note: The intercom wire and speakers shall be fully installed eight (8) weeks prior to the opening day of school so WCPS personnel can install the intercom system and audio switching modules. This will give time for any corrections that must be made before school begins.

F. Install system to comply with drawings and final shop drawings in compliance with manufacturer’s printed instructions.

G. Cable Identification shall be provided on both ends of each cable and termination with the Owner’s room number and the wiring block or device to which it is connected. Tags shall be permanent and neat.

H. Contractor shall use the types of wire recommended by BOGEN. However, the size and quality shall not be less than that previously specified or indicated on the drawings. If cross talk, appreciable loss of volume or distortion occurs after installation has been completed, it shall be the mutual responsibility of the Low-Voltage Contractor and Manufacturer to correct any such condition without cost to the Owner. The Low-Voltage Contractor in no case shall use the type of wire which he merely assumes to be the best. This recommendation shall be from the equipment manufacturer.

I. The master control processor shall be bonded to the telecommunications system grounding system in the nearest IDF/MDF. Bond conductor shall be a minimum #6 AWG ground wire.

J. Weatherproof Equipment: For units that are mounted outdoors, in damp locations, or where exposed to weather, install consistent with requirements of weatherproof rating.

K. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables”.

3.4 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

3.5 PROTECTION

A. The contractor shall provide all necessary transient protection on the AC power feed and on all station, lines leaving or entering the building.

B. The contractor shall note in their system drawings, the type and location of these protection devices as well as all wiring information.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two (2) 8-hour visits to Project during other-than-normal occupancy hours for this purpose.

END OF SECTION 270600

SECTION 270610 – VOICE AND DATA SYSTEM

PART 1 - GENERAL

1.1 Work Included

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Construction Documents

1.2 Scope of Work

A. This document describes the products and execution requirements relating to furnishing and installing Telecommunications Cabling for the horizontal cabling comprised of Copper and Optical Fiber Cabling, and support systems are covered under this document.

B. Install a structured cabling system that will be able to support interconnections to active telecommunications equipment for voice and data applications in a multi-vendor, multi-product environment. The structured cabling system shall adhere to applicable standards as listed below with respect to performance, pathways, distribution, administration, and grounding of the system. The structured cabling system to be installed shall also follow the guidelines spelled out in this RFP in accordance to local codes and regulations.

C. For Reference, each Standard work area outlet shall consist of three terminated cables capable of accommodating voice and/or data applications. Each meeting room shall have four work area outlets each consisting of two terminated cables capable of supporting voice and/or data applications. There will also be convenience phone outlets that will consist of a single terminated cable that will be installed in the proper faceplate to accommodate each work area's phone.

D. Install, terminate, test, and guarantee each work area termination per all applicable standards and customer preferences.

E. The horizontal cabling infrastructure components, permanent link and channel shall meet Cat 6 performance as defined by this document. Horizontal Unshielded Twisted Pair (UTP) cables shall home run from the work area outlet to a Telecommunications Room dedicated to that floor. The UTP cable will be individually terminated with Cat 6 rated jacks that will populate a modular 48 port flush mount patch panel. All cables shall be patched at cutover as an interconnect to the floor serving active equipment. Equipment cords shall be Cat 6.

F. The floor serving active data equipment shall be interconnected to the facility serving data equipment via a fiber backbone terminated in 19" rack mounted fiber optic enclosures which will utilize LC fiber optic connections. This shall serve to connect the Main Distribution Frame (MDF) to Intermediate Distribution Frames (IDF) where distances exceed 90 meters.

G. Contractor shall be responsible for extending existing pathways as necessary to complete the system per ANSI/TIA/EIA-569.

H. This section includes minimum requirements for the following:
- UTP Cable from TR to Work Area
- UTP/Fiber/ WA Equipment Cords
- Category 6 UTP Connector Modules
- Optical Fiber Connector Modules

- Faceplates and Modules
- Racks, Cabinets, and Cable Management
- Grounding & Bonding

I. All cables and related terminations, support and grounding hardware shall be furnished, installed, tested, labeled, and documented by the Contractor as detailed in this document.

J. Product requirements, general design considerations, and installation guidelines are provided in this document. Manufacturers, quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document. If the bid documents are in conflict, formal clarification shall be obtained from in the form of Question Clarification Request. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

1.3 Regulatory References

A. The following industry standards are the basis for the structured cabling system described in this document.

1. Commercial Building Communications Standards

a	ANSI/TIA-568-C	Commercial Building Telecommunications Cabling Standard
b	ANSI/TIA-568-C.0	Generic Telecommunications Cabling for Customer Premises
c	ANSI/TIA-568-C.1	Commercial Building Telecommunications Cabling Standard
d	ANSI/TIA-568-C.2	Balanced Twisted-Pair Telecommunications Cabling and Components Standard
e	ANSI/TIA-568-C.3	Optical Fiber Cabling Components Standard
f	TIA/EIA-942	Telecommunications Infrastructure for Data Centers
g	TIA/EIA-569-B	Commercial Building Standard for Telecom Pathways and Spaces
h	TIA/EIA-606-B	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
i	ANSI/TIA-607-C	Commercial Building Grounding/Bonding Requirements
j	BICSI TDMM	Building Industry Consulting Services International, Telecommunication Distribution Methods Manual
k	BICSI ITS	Building Industry Consulting Services International, Information Transport System

2. NEC

a	NFPA 70	National Fire Protection Agency
b	NEC	National Electric Code

3. CSA

a	C22.1-06	Canadian Electric Code (CEC)

4. ISO/IEC

a	ISO 11801	Generic Cabling for Customer Premises

B. If there is a conflict between applicable documents, then the more stringent requirement shall apply. Contractor has the responsibility to adhere to the most recent Standard when developing the proposal for installation.

C. This document does not replace any code, either partially or wholly. The contractor shall be aware of local codes that may impact this project.

1.4 Special Requirements

A. Provide blue jacks on patch panels and wall plates for normal network data.
B. Plenum CAT 6 for all normal network data wiring to be blue.
C. Provide white Jacks on patch panels and wall plates for normal phone data.
D. Plenum CAT 6 for all normal phone data wiring to be white.
E. Orange Jacks on patch panels and wall plates for all camera network.
F. Plenum CAT 6 for all camera network wiring to be orange.
G. Provide green Jacks on patch panels and wall plates for all WAPs.
H. Plenum CAT 6A for all WAP wiring to be green.
I. Provide yellow jacks on patch panels and wall plates for all Electrical/HVAC/Lighting and building support.
J. Plenum CAT 6 and other wiring for all Electrical/HVAC/Lighting and building support wiring to be yellow.
K. Red cabling to be reserved for Fire Alarm
L. Audio (Speaker/Intercom) wiring to be Gray or Black. Can be white if gray or black is not available.
M. Patch panels to have support bar to support cables.
N. All underground network cable shall be in conduit and shall be outside plant rated. Any network cable in underground conduit shall be gel filled or direct bury rated. Jacket may be black in this case. Jack must be appropriate color.
O. Rack Organization
    1. All floor mounted racks shall be 4 post.
    2. Patch panels shall have support bar for each panel.
    3. Rack 1:
        1 - Fiber Patch panel (determine Unit size based on closet/school needs) (MDF Closet may require multiple to supply enough ports for IDF Closets)
        2 - 24 Port Patch Panel unloaded block off port 24 (Keep this entire patch panel empty for future use)
        3 - Wiring Management
        4 - Network Switch (1U District provided 48 port)
        5 - Wiring Management
        6 - 24 port Patch Panel Unloaded Block off port 24
        7 - 48 Port Patch Panel Unloaded Block off port 22, 23, 24 46, 47, 48
        8 - Wire Management
        9 - Network Switch (2U District Provided 96 port)
        10 - Wire management
        11 - 48 Port Patch Panel unloaded Block Port 24, 48
        12 - 48 Port Patch Panel unloaded Block off port 22, 23, 24, 46, 47, 48
        13 - Wire management
        14 - Network Switch (2U District Provided 96 port)
        15 - Wire Management
        16 - 48 Port Patch Panel Unloaded Block Port 24, 48
        17 - Wire Management
    4. If there are 2 or more racks in a closet, then there will be additional wire management between racks
    5. Rack 2(or more)
        1 - 48 Port Patch Panel Unloaded Block off port 22, 23, 24 46, 47, 48
        2 - Wire Management
        3 - Network Switch (2U District Provided 96 port)
        4 - Wire management
        5 - 48 Port Patch Panel unloaded Block off port 24, 48
        6 - 48 Port Patch Panel unloaded Block off port 22, 23, 24, 46, 47, 48
        7 - Wire management
        8 - Network Switch (2U District Provided 96 port)
        9 - Wire Management

10 - 48 Port Patch Panel Unloaded Block off port 24,48
11 - Wire Management

P. Wire Labeling
1. MDF Closet shall be labeled “A”.
2. IDF Closets labeled B, C, etc.
3. Rack in each closet is in numerical order starting at 1 then next sequential order.
4. Each patch panel on each rack start at top and Label A then B then C and continue in sequential order down (48 port panels are 1 designation).
5. On the face of the patch panel label with RM###. This includes storage rooms.
6. Wall plate, behind wall plate on wire and behind patch panel on wire shall have a wire label as follows:
   a Closet Aor B or C) Rack Number 1 or 2 or 3) Patch Panel A or B or C (Pert Number on respective patch panel)
   Example: “B2C20” is IDF Closet B Rack 2 Panel C Port 20

1.5 Quality and Performance Assurance

A. Quality Assurance

1. Cabling System Warranty
   a A shall provide a complete PANDUIT® CERTIFICATION PLUS™ System Warranty to guarantee a high-performance cabling system that meets application requirements. The guarantee shall include all cable installed in the structured cabling system. The System shall be warranted for a period of 25 years.
2. Manufacturers System Warranty
   a A PANDUIT® CERTIFICATION PLUS™ System Warranty shall provide a complete system warranty to guarantee end-to-end high-performance cabling systems that meet customer’s future application requirements. The guarantee shall include all copper connectivity components. The system shall be warranted for a period of 25 years.

B. Performance Assurance

1. All manufacturers’ non-consumable products must have at least a 20-year guarantee. When installed per TIA or ISO/IEC standards, the manufacturers’ network cabling system will operate the application(s) for which the system was designed to support.
2. In order to meet the requirements of this document the structured cabling system must be installed per the following
   a. Meet all TIA/EIA commercial building wiring standards
   b. The manufacturer will provide a single source solution for the end-to-end installation; acceptable end-to-end solutions are defined here within.
   c. The manufacturers’ products must be installed by an installation contractor bearing the installation certification of that manufacturer.

Installer: Company specializing in installing products specified in this section with minimum three years documented experience, and with service facilities within 120 miles of project. The Electrical/Telecommunications contractor must be a Panduit Certified Installer (PCI) and a qualified BICSI trained installer. A copy of certification documents for each must be submitted with the quote in order for such quote to be valid.

Note: All Networks shall be installed per applicable standards and manufacturer's guidelines.

1.6 Approved Product Manufacturers

A. Cable and Connectivity

1. Approved manufacturers for cable and connectivity are based on performance. To achieve a standard product approach the following manufacturers are approved for installation. However, product choices must be made within the manufacturers approved set. No mixing and matching beyond what is shown in the horizontal rows of the following matrix.

Choice	UTP Cable	Jacks/Work Area	Patch Panels	Patch Cords	Fiber Products
1	Panduit/General	Panduit	Panduit	Panduit	Panduit

B. Support Products

1. Support products include pathways, spaces, attachment hardware and grounding hardware. The following product sets:
   a Cable tray and ladder rack
   b J-Hooks
   c Telecommunication Cabinets
   d Free-Standing relay racks
   e Ground bars, lugs, and cable
   f Hook and loop cable ties
2. Approved manufacturers for support products are based on availability and functionality. The following are approved:
   a Panduit
   b Chatsworth Products (CPI)
   c Cooper B-Line

PART 2 - PRODUCTS

2.1 Equivalent Products and Substitutions

A. Panduit shall manufacture all products, including but not limited to cable management, faceplates, copper modules, patch panels, racks, 110 blocks, patch cords, labels, grounding lugs, fiber cable and fiber connectivity for this document.

B. Panduit shall manufacture all data/telecommunication and fiber cable and connectivity.

2.2 Substitutions – (no exceptions)

A. This is a performance-based single source solution. Therefore, substitutions are highly discouraged. Substitutions must follow the same rigid standards for quality and termination style as those described in section 2.3 and 2.5.

B. Any Contractor wishing to offer structured cabling products other than those specified herein shall submit a request for product substitution in writing no less than one week in advance of bid. Written requests for substitution shall be accompanied by all drawings, specification sheets and engineering documents, as well as third party laboratory performance test results proving equivalency in performance and manufacturing style.

C. This written documentation shall be accompanied by samples of the substitution product offered for evaluation. Equal product acceptance must be received in writing.

D. Contractor shall be responsible and assume all costs for removal and replacement of any substituted product installed without prior written approval. Such costs shall include, but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

2.3 Work Area Subsystem

A. The Work Area shall consist of the connectivity equipment used to connect the horizontal cabling subsystem and the equipment in the work area. Both copper and fiber media shall be supported. The connectivity equipment shall include the following options:
- Patch (equipment) cords and modular connectors
- Outlets and surface mount boxes
- Surface raceway and outlet poles
- Consolidation point / MUTOA

B. Patch Cords and Modular Connectors

1. The modular connectors and patch cords shall be chosen to match the horizontal cabling medium and rating. The same manufacturer shall provide the modular connectors and patch cords. The total patch cord length at the work area is not to exceed 3 meters (10 ft). Exception: When implementing an open office cabling system as specified under TIA/EIA TSB-75 (see section 3.4).

2. Copper Connectivity
The *PANDUIT MINI-COM® Network Cabling System* shall be used for the Work Area subsystem, including all modular connectors. The network cabling system shall be comprised of modular connectors in support of high-speed networks and applications designed for implementation on copper cabling. All outlets shall utilize fully interchangeable and individual connector modules that mount side-by-side to facilitate quick and easy moves, adds and changes.

MINI-COM® TX-6™ TG Modules shall be Category 6 modules featuring *GIGA-TX™* Technology. The eight position modules shall be used in all work areas and shall exceed the connector requirements of the TIA/EIA Category 6 standard. Termination shall be accomplished by use of a forward motion termination cap and shall not require the use of a punch down tool. The termination cap shall provide strain relief on the cable jacket, ensure cable twists are maintained to within 1/8" (3.18mm) and include a wiring scheme label. The wiring scheme label shall be available with both T568A and T568B wiring schemes. All terminations for this project shall use the T568B (B) wiring scheme. The modules shall terminate four-pair 24 and 22 AWG 100-ohm solid unshielded twisted pair cable. The modules shall be universal in design, including complying with the intermate ability standard IEC 60603-7 for backward compatibility. Category 6 modules shall have UL and CSA approval. The modules shall have ETL verified Category 6 performance and ISO Class E performance (as defined in ISO/IEC 11801) in both the basic and channel links. They shall be universal in design, accepting six or eight-pair modular plugs without damage to the outer module contacts. The modules shall be able to be re-terminated a minimum of 10 times and be available in 11 standard colors for color-coding purposes. The module shall snap into all *MINI-COM®* outlets and patch panels. The module shall include an ivory colored base to signify Category 6 350 MHz performance.

Part Number	Style	Category	Colors
CJ688TG**	RJ45	6	11

** Designates color

TX6 ™ PLUS Patch Cords shall be used between the work area outlet and the end user

equipment at the work area. The patch cords shall be factory terminated with modular plugs featuring a one-piece, tangle-free latch design and strain-relief boots to support easy moves, adds and changes. They shall be constructed with Category 6 28-AWG stranded UTP cable. Each patch cord shall be 100% performance tested at the factory in a channel test to the Category 6 standard. The patch cords shall come in standard lengths of three, five, seven, ten, fourteen, and twenty feet and six colors of Black, Blue, Green, Red, Yellow and Off White.

Part Number	Length (ft)	Length (M)
UTP28SP3**	3	0.91
UTP28SP5**	5	1.52
UTP28SP7**	7	2.13
UTP28SP10**	10	3.04
UTP28SP14**	14	4.27
UTP28SP20**	20	6.10

** Designates color

Additional *MINI-COM*® Modules for copper shall include the following:

- 50 and 75 Ohm BNC coax coupler modules, male-male
- F-Type coax coupler module, male-male threaded
- RCA connector modules with black, red, yellow, and white inserts
  -Solder, pass through and punch down termination types
- S-Video connectors' modules - coupler and punch down termination types
- Blank module to reserve space for future additions

The connectors shall snap into all *MINI-COM* outlets and patch panels.

2.4 Horizontal Distribution Cabling

A. Copper UTP Cable

Recommended design shall include:

a Minimum one Four-pair 100 ohm 24 AWG, UTP cable—Category 5e for voice
b Minimum one Four-pair 100 ohm, 24/23 AWG, UTP cable—Category 6 for data
c Maximum cable length is 90 meters
d All cable shall meet or exceed the following specifications

The *PANDUIT*® TX Copper Cable or equivalent shall be used for the horizontal cabling subsystem. These requirements are for cables of unshielded 24 AWG bare copper conductors, insulated with thermoplastic, twisted into pairs and enclosed in a thermoplastic jacket. The finished cable shall meet or exceed the following requirements of ANSI/EIA/TIA-568-B.

These specifications are for cable that will meet or exceed the requirements of ANSI/TIA/EIA Category 6 Cabling.

The *PANDUIT*® TX Copper Cable or equivalent shall be used for the horizontal cabling subsystem. These requirements are for cables of unshielded 24/23 AWG bare copper conductors, insulated with thermoplastic, twisted into pairs and enclosed in a thermoplastic jacket. The finished cable shall meet or exceed the following requirements of ANSI/EIA/TIA 568-B-2.1.

All cable shall conform to the requirements for communications circuits defined by the National Electrical Code (Article 800) and the Canadian Building Code. Cable listed to NEC Article 800-51(a) will be used for "Plenum" installations and carry labeling of CMP. Cable listed to NEC Article 800-51(b) shall be installed in vertical runs penetrating more

than one floor and carry the labeling of CMR.

The cable manufacturer shall be ISO 9001 registered.

As a minimum, every Master Reel shall be tested for Attenuation, Pair to Pair and Power Sum Crosstalk, Impedance, and RL. This testing shall be performed using a sweep test method and include frequencies from .772 MHz to 350 MHz. All testing shall be done in accordance with ASTM D 4566.

A test report is provided indicating the Master reel number, the date of the test, and test results for RL, Attenuation, Crosstalk. Power Sum may be listed as Pass/Fail. Characteristic impedance shall be shown for each pair.

Part Number	Category	Colors
PUR6004**-UY	6	4
PUP6004**-UY	6	4

** Designates color

B. Fiber Cable

ANSI/TIA/EIA-568-B.3 Horizontal fiber cable distribution systems:

a Fiber deployments < 550m, the optical fiber shall be multimode, graded-index with a nominal 10Gb/s, OM3, 50/125µm core/cladding diameter

b Fiber deployments > / = 550m, the optical fiber shall be single mode, OS2, 9/125µm core/cladding diameter

c The mechanical and environmental specification for the optical fiber cable will be in accordance with ANSI/ICEA-S-83-596

Multimode, OM3, 50/125µm optical fiber

Wavelength (nm)	Maximum Attenuation (dB/km)
850	3.5
1300	1.5

Part Number	Type	Strands	Jacket
FODRX12Y	OM3 / Indoor	12	Dielectric / Riser
FODPX12Y	OM3 / Indoor	12	Dielectric / Plenum
FOPRX12Y	OM3 / Indoor	12	Armored / Riser
FOPPX12Y	OM3 / Indoor	12	Armored / Plenum

Single mode, OS2, 9/125µm optical fiber

Wavelength (nm)	Maximum Attenuation (dB/km)
1310	0.75
1550	0.75

Part Number	Type	Strands	Jacket
FSDR906Y	OS2 / Indoor	6	Dielectric / Riser
FSDP906Y	OS2 / Indoor	6	Dielectric / Plenum
FSPR906Y	OS2 / Indoor	6	Armored / Riser
FSPP906Y	OS2 / Indoor	6	Armored / Plenum

C. Fiber Optic Hardware

Panduit Optical Cable Systems shall be used for the Work Area subsystem, including all modular connectors. The network cabling system shall be comprised of Panduit Fiber Optic modular work area adapters in support of high-speed networks and applications designed for implementation on multimode 50/125 μm glass fiber cabling. All outlets shall utilize interchangeable and individual connector modules that mount side by side to facilitate quick and easy moves, adds, and changes. Approved components of the Fiber Termination Hardware for the Work Area Subsystem shall include but are not limited to:

a LC Style Connectors

Panduit LC Optical Fiber Patch Cords shall be constructed from high performance 50/125μm multimode cable and simplex connectors with ceramic ferrules. Integral boots shall be provided to provide strain relief and help maintain consistent polarity. They shall come in standard lengths.

D. Outlets and Surface Mount Boxes

The outlets and surface mount boxes shall support the network system by providing high-density in-wall, surface mount or modular office furniture cabling applications. The outlets consist of faceplates for flush and recessed in-wall mounting as well as mounting to the modular office furniture systems. The surface mount boxes can be mounted where in-wall applications are not possible or to support applications where surface mount is the best option. All outlets shall utilize fully the interchangeable and individual *MINI-COM*® connector modules that mount side by side to facilitate quick and easy moves, adds and changes. All outlets shall be manufactured from high-impact thermoplastic material with a U.L. flammability rating of 94 HB or better.

1. Wall Faceplates

MINI-COM® Ultimate ID *Series* Faceplates shall be *2, 4, and 6-port vertical single gang and 8 and 10-port vertical double gang* faceplates with combination screw head covers. The faceplates shall mount to standard U.S. NEMA boxes and adapters with screw-to-screw dimensions of 3.28" (83.3mm). The insert labels shall meet UL 969. Each faceplate shall accept *MINI-COM* modules that can be individually inserted and removed as required.

Classic Series Faceplates	Description
CFPL(x)**Y	Single gang, vertical w/labels, 2, 3, 4 or 6 ports
CFP(x)**	Single gang, vertical, 1, 2 or 4 ports
CFPH(x)**	Single gang, horizontal, 2 or 4 port
CFPSL(x)**Y	Single gang, sloped vertical w/labels, 2, 4 or 6 ports
CFPHSL4**Y	Single gang, horizontal sloped w/labels, 4 port
CBX(x)**-A	Low profile surface mount box, 1, 2 or 4 ports. Plenum rated.

(x) Designates port count / ** Designates color

E. Wireless Access Points (WAP's)

Two Cat 6A UTP plenum cables shall be installed to each WAP. In addition, Panduit plenum rated ancillary components shall also be used in the deployment of the WAPs and may include Surface Mount Boxes and Jack Modules. Cable and Jack Modules shall be green.

2.5 Telecommunication Room

The telecommunications room (TR) includes those products that connect the networking equipment to the horizontal and backbone cabling subsystems. These products include termination hardware (connectors and patch cords), racks, cable management products and cable routing products.

A. Cable Termination Hardware

Each horizontal or backbone cabling run will be terminated using appropriate connectors or connecting blocks depending upon the cable type. Matching patch cords will be used to perform cross-connect activities or to connect into the networking/voice hardware.

B. Category 6 Enhanced Unshielded Twisted Pair (UTP)

Four-pair Category 6 UTP cabling shall be terminated onto a four-pair Category 6 module. All modules shall be terminated using the T568B (B) wiring scheme. The eight-position module shall exceed the connector requirements of the TIA/EIA Category 6 standard. The jack termination to 4-pair, 100 ohm solid unshielded twisted pair cable shall be accomplished by use of a forward motion termination cap and shall not require the use of a punch down or insertion tool.

Part Number	Style	Category	Colors
CJ688TG**	RJ45	6	11

MINI-COM® Modular Patch Panels shall be of a metal design with snap in four position and six position molded faceplate frames. The patch panels shall be modular accepting all *MINI-COM* modules. The faceplate frames shall be releasable from the front to provide access to the modules and terminated cable, except for the Flush Mount design where faceplates are mounted through the back of the panel. Patch panels shall be available in standard or high-density configuration and flat or angled design. Modules shall be mounted to the patch panel using *MINI-COM* mounting features for added strength. Patch panels shall be available with and without labels

MINI-COM ®Flush Mount Modular Patch Panels shall be of metal design with rear-mounted faceplates allowing modules to be flush with the front of the patch panel. There shall be pre-printed numbers above each port for easy identification and white write on areas for port and/or panel identification on the 24 and 48 port version. Panels shall be available in flat or angled versions. Angled panels facilitate proper bend radius control and minimize the need to horizontal cable managers. High density (72 port in 2 RU) versions are also available. Strain Relief Bars (Panduit P/N: SRB19BLY) shall be installed on the rear of all patch panels.

Part Number	Flat/Angled	Ports	High Density	RU
CPP24FMWBL	F	24	-	1
CPP48FMWBL	F	48	-	2

TX6 ™ PLUS Patch Cords shall be used between modular patch panels configured as a cross-connect or between the patch panel and networking hardware when the patch is used as an interconnect. The patch cords shall be factory terminated with modular plugs featuring a one-piece, tangle-free latch design and black strain-relief boots to support easy moves, adds and changes. They shall be constructed with Category 6 24-AWG stranded UTP cable. Each patch cord shall be 100% performance tested at the factory in a channel test to the Category 6 standard. The patch cords shall come in standard lengths of three, five, seven, 10 14, and 20 feet and six colors of Black, Blue, Green, Red, Yellow and Off White.

Part Number	Length (ft)	Length (M)

UTP28SP3**	3	0.91
UTP28SP5**	5	1.52
UTP28SP7**	7	2.13
UTP28SP10**	10	3.04
UTP28SP14**	14	4.27
UTP28SP20**	20	6.10

** Designates color

C. Fiber Termination Hardware

LC Fiber Optic Connectors

LC OptiCam® Fiber Optic Connectors- Pre-Polished Cam Termination
LC small form factor (SFF) pre-polished connectors with rear pivot latch shall be TIA/EIA-604 FOCIS-10 compatible and contain a factory-terminated fiber, eliminating field polishing and adhesive. LC pre-polished connectors shall have an average insertion loss of 0.3dB per mated pair for multimode fiber. LC pre-polished connectors shall capture fiber and buffer in one action allowing for up to two re-terminations with no degradation in performance

Technical Information

Standards requirements: TIA/EIA-604 FOCIS-10 compatible; exceeds TIA/EIA-568-B.3 requirements
Fiber compatibility: 10Gig™ 50/125µm laser optimized OM3 and 9/125µm OS1
Fiber cable type: 900µm tight-buffered cable only
Fiber cable size: 1.6mm – 2.0mm and 3.0mm jacketed cable with optional boots
Ferrule type: Zirconia ceramic with a pre-polished fiber stub
Insertion loss: Ceramic: 0.3dB average (multimode and single mode)
Return loss: Ceramic: >20dB (multimode), >26dB (10GIG™ multimode), >50dB (single mode)

Part Number	Connector Type	Fiber
FLCDMCXAQY	LC Duplex	OM3/OM4
FLCDSCBUY	LC Duplex	OS1/OS2

Fiber Patch Cords

Technical Information

Standards Requirements: Meets or exceeds IS)/IEC 11801, TIA-568-C.3, TIA-604-10 (FOCUS-10). 500 mating cycles.
Insertion loss: Per connection: 0.15dB max. (OM3/OM4), 0.35dB max. (OS1/OS2)
Return loss: 26dB min. (OM3/OM4), 55dB min. (OS1/OS2)
Riser or plenum rated jacket: Meets UL1666 (OFNR) or NFPA 262 (OFNP) flame ratings for standard compliant safety
Test data: Supplied with each patch cord and pigtail Establishes a performance reference to streamline maintenance

Q.C. identification label: Quality control reference provides lifetime traceability of test data

Part Number	Connector Type	Fiber
FX2ERQ1Q1SNM***	LC Duplex	OM3/OM4
F92ERLNLNSNM***	LC Duplex	OS1/OS2

*Indicates length in meters. Patch cords are available in 1m – 10m lengths in 1m increments

and 15m, 20m, 25m and 30m lengths. Pigtails are available in 1m, 2m, and 3m lengths.

Rack Mount Fiber Enclosures

Opticom rack mount fiber enclosures shall be constructed of steel material and mount to standard 19" or 23" EIA rack or cabinet and shall be RoHS compliant. Holds fiber adapter panels and fiber optic splice modules. Front and rear access on all models via durable molded-hinge doors. Integral bend radius control and cable management for fiber patch cords. Multiple trunk cable entry locations provided on rear and sides of enclosure. Includes fiber optic cable routing kit (grommets, cable ties, spools, strain relief bracket and ID/caution labels).

Part Number	Dimensions	Capacity
FCE1U	1.74"H x 19"W x 18"D	Up to 96 fibers
FCE2U	3.48"H x 17.60"W x 16.30"D	Up to 192 fibers
FCE4U	6.98"H x 17.60"W x 16.30"D	Up to 288 fibers

Wall Mount Enclosures

Wall mount enclosures shall be constructed of steel material. Enclosures shall provide cable bend radius protection. Enclosures offer optional discrete locking capability between installer and user segments.
Optional splicing tray and holder: Allows splicing within patching enclosures

Part Number	Dimensions	Capacity
FWME2	12.00"W x 10.18"H x 2.32"D	Up to 48 fibers
FMWE4	16.11"W x 12.25"H x 3.52"D	Up to 96 fibers
FMWE8	16.11"W x 20.25"H x 3.52"D	Up to 192 fibers

D. Racks, Cabinets, and Cable Management

The Cable Management System shall be used to provide a neat and efficient means for routing and protecting fiber and copper cables and patch cords on telecommunication racks and enclosures. The system shall be a complete cable management system comprised of vertical and horizontal cable managers to manage cables on both the front and rear of the rack. The system shall protect network investment by maintaining system performance, controlling cable bend radius, and providing cable strain relief.

A. Rack System

Cable Management shall be provided using the Panduit 2-Post and 4-Post rack system. Panduit 2-Post racks shall be used for Patch Panels or mounting of equipment of up to 1000 lbs. Panduit 4-Post Racks shall be used mainly for secure equipment mounting of up to 2500 lbs and be available in tapped and cage nut versions. The racks shall have essential accessories such as shelves, top and bottom troughs. The racks shall have integral mounting systems for the Patch Runner vertical managers. These racks support heavy equipment for cross connect or interconnect applications in a data center or telecommunications room. The Rack system shall meet all EIA requirements as defined in EIA-310-D.

Part Number	Posts	RU	Mounting
R2P	2	45	Threaded
R4P	4	45	Threaded
RP4CN	4	45	Cage Nut

B. Vertical Cable Management

Vertical cable managers shall include components that aid in routing, managing and organizing cable to and from patch panels and/or equipment. Managers shall protect network equipment by controlling cable bend radius and providing cable strain relief. Managers shall be a universal design mounting to EIA 19" or 23" racks and constructed of a base with cable management fingers.

The fingers shall include retaining tabs to keep cables in place during cover removal. The covers shall be hinged to open in either direction allowing for quick moves, adds, and changes.

A vertical cable management solution of flexible Vertical D-rings shall be used on standard communication racks. The Vertical D-rings used for open access shall be manufactured from a Polycarbonate material and shall be black in color. The vertical cable management D-rings shall be a one-piece design. The front arm of the product shall be able to rotate ninety degrees to allow entire cable bundles to be inserted. The vertical cable management solution of flexible D-rings shall be installed with two screws less than 0.25” in diameter.

Part Number	Type	RU	Width
PRV8	Manager	45	8”
PRD8	Door	-	8”
PRV10	Manager	45	10”
PRD10	Door	-	10”
PRV12	Manager	45	12”
PRD12	Door	-	12”

C. Horizontal Cable Management

Horizontal cable managers shall include components that aid in routing, managing and organizing cable to and from patch panels and/or equipment. Panels shall protect network equipment by controlling cable bend radius and providing cable strain relief. Panels shall be a universal design mounting to EIA 19" racks and constructed with cable management fingers. The fingers shall include retaining tabs to keep cables in place during cover removal. The covers shall be easily removed or hinged to allow for quick moves, adds, and changes. The cable managers shall be provided with wire retainers to retain the cables during cover removal and #12-24 English and M6 metric mounting screws.

Part Number	Type	Rack Spaces	Max. Front Extension (in.)
WMPH2E	Front & Rear Duct	2	3.1
WMP1E	Front & Rear Duct	2	3.1
WMPHF2E	Front Duct	2	3.1
WMPF1E	Front Duct	2	3.1
WMPSE	Front and Rear	1	3.1
WMPLSE	Front and Rear	1	3.1
WMPFSE	Front Duct	1	2.1
WMPLFSE	Front Duct	1	2.1

D. Grounding and Bonding

A Primary Bonding Busbar (PBB) shall be located at the service entrance. A Secondary Bonding Busbar (SBB) shall be installed in each telecommunications space. The SBB will be bonded to the PBB.

The PBB shall be bonded to building steel and grounded/earthed to the electrical service ground per ANSI/TIA-607-C guidelines. Each SBB shall be bonded to building steel and the electrical panel serving equipment in the telecommunications space.

The gauge of the connecting ground/earth cable, known as the Telecommunications Bonding Backbone (TBB) will follow ANSI/TIA-607-C guidelines, as is shown in the table below.

Sizing of the TBB	
TBB Length in Linear meters (feet)	TBB Size (AWG)
Less than 4 (13)	6
4-6 (14-20)	4
6-8 (21-26)	3
8-10 (27-33)	2
10-13 (34-41)	1
13-16 (42-52)	1/0
16-20 (53-66)	2/0
20-26 (67-84)	3/0
26-32 (85-105)	4/0
32-38 (106-125)	250 kcmil
38-46 (126-150)	300 kcmil
46-53 (151-175)	350 kcmil
53-76 (176-250)	500 kcmil
76-91 (251-300)	600 kcmil
Greater than 91 (301)	750 kcmil

Route the TBB to each SBB in as straight a path as possible. The TBB should be installed as a continuous conductor, avoiding splices where possible. Use *PANDUIT* part number series HTWC to tap into the TBB where necessary. When more than one TBB is used, bond them together using the SBB's on the top floor and every third floor in between with a conductor known as a Bonding Backbone Conductor (BBC). Use the ANSI/TIA-607-C guidelines for sizing of the TBB and BBC (shown in the table above).

Components, Kits, and Hardware
PANDUIT® *STRUCTUREDGROUND*™ Grounding System (*STRUCTUREDEARTH*™ Earthing System) kits, components, and hardware shall be used to construct the grounding/earthing system.

Use *PANDUIT* GB4 series BICSI/TIA-607 telecommunications grounding busbars for the PBB, which is ideally located at the AC service entrance. Use a *PANDUIT* GB2 series busbar for the SBB in each of the other telecommunications/equipment spaces throughout the building. Use *PANDUIT* LCC-W series lugs when connecting conductors to the PBB and SBB.

Construction of the Grounding/Earthing System
Avoid routing grounding/earthing conductors in metal conduits. If the grounding/earthing conductor must be routed through a metal conduit, bond each end of the conduit to the grounding/earthing conductor. Use *PANDUIT* GPL series grounding clamps to bond to the conduit, a *PANDUIT* HTWC HTAP with clear cover to bond to the grounding/earthing conductor, and a #6 AWG copper conductor to connect the GPL grounding clamp to the HTWC HTAP.

In telecommunications spaces with a small number of racks or cabinets, it may be most convenient to bond the grounding/earthing jumper cable directly to the SBB. Larger spaces require a mesh Common Bonding Network, as described below.

Cable Sizes for Other Grounding/Earthing Applications Not Specifically Described Elsewhere in This Document	
Purpose	Copper Code Cable Size
Aisle grounds (overhead or under floor) of the common bonding network	#2 AWG
Bonding conductor to each PDU or panel board serving the room.	Size per NEC 250.122 & manufacturer recommendations
Bonding conductor to HVAC equipment	#6 AWG
Building columns	#4 AWG
Cable ladders and trays	#6 AWG
Conduit, water pipe, duct	#6 AWG

Wire Basket Bonding

Wire baskets shall be bonded per the manufacturer's installation instructions. Bond shall be made in accordance with figure 2 below to the mesh Common Bonding Network (CBN).

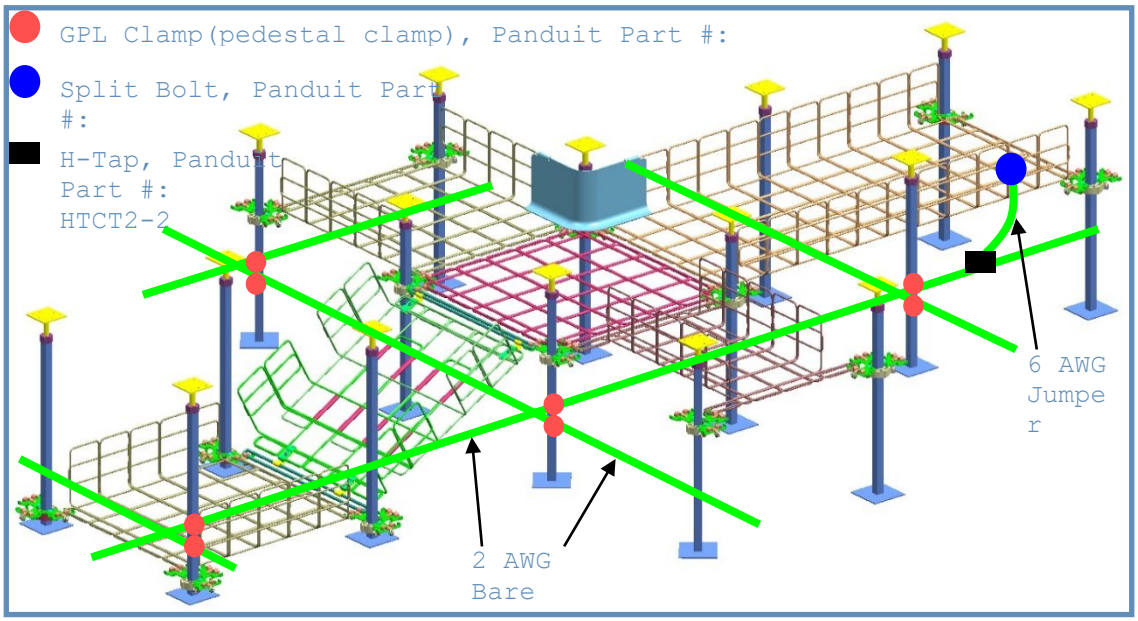


Figure 2 – Wire Basket Bonding

Attach a #6 AWG jumper to the Wire Basket with a split bolt. Then use an HTAP to attach the other end of the jumper to the mesh CBN. The size of the mesh CBN will determine the size of the HTAP. *PANDUIT* part number HTCT2-2-1 can be utilized for a #6 AWG - #2 AWG.

Ladder Rack Bonding

Ladder racks shall be bonded per the manufacturer's installation instructions. The bond shall be made in accordance with Figure 3 below to the mesh Common Bonding Network.

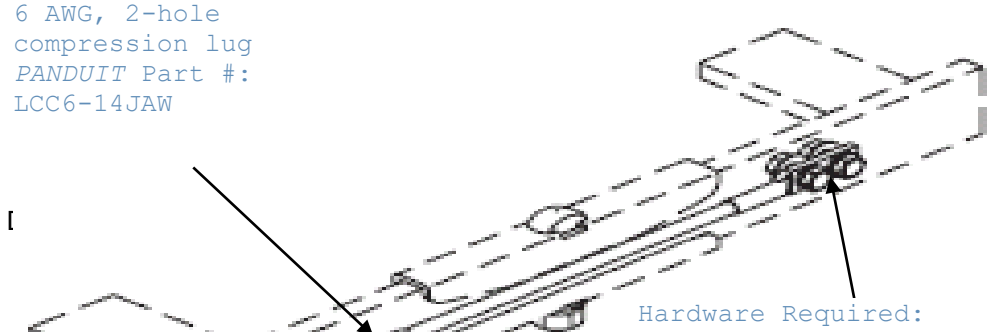


Figure 3 – Ladder Rack Bonding

To provide electrical continuity between ladder rack segments drill holes in rack and use a #6 AWG code cable with green/yellow stripe to jumper between segments. The jumper shall be made with 2-hole copper compression connectors, *PANDUIT* part series LCC-W, terminated on both ends. Attach jumper to ladder rack with hardware listed in figure 3 above. Once the ladder rack segments are bonded together, it shall be bonded to the SBB with *PANDUIT* part series LCC-W.

Rack Grounding/Earthing

Equipment and racks shall be bonded in accordance with the methods prescribed in ANSI/TIA-942, as is shown in figure 4 below.

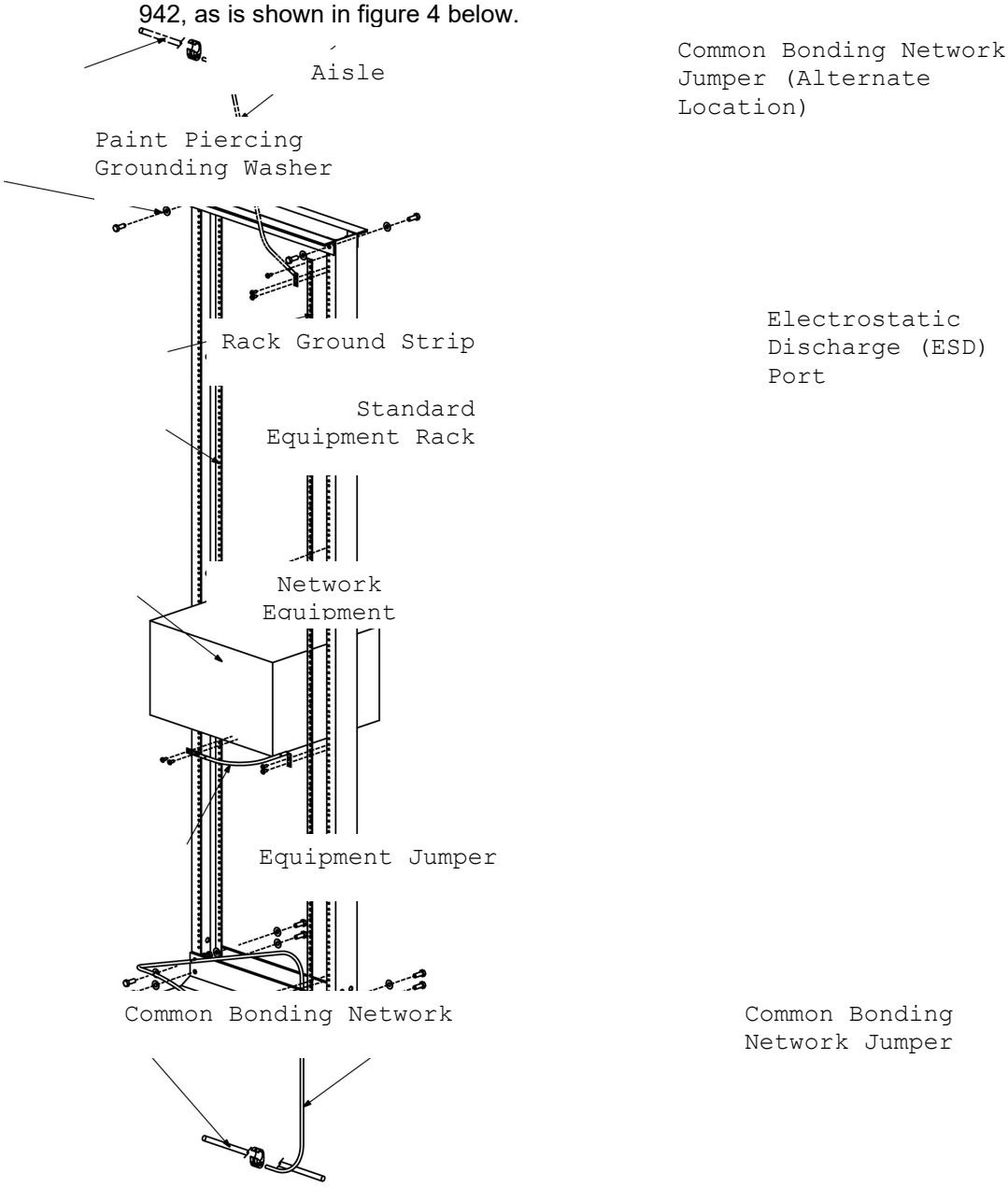


Figure 4 - Properly Grounded/Earthed Rack (Back of Rack Shown)

To provide electrical continuity between rack elements, *PANDUIT* paint piercing grounding washers, series RGW, shall be used where rack sections bolt together, on both sides, under the head of the bolt and between the nut and rack.

All racks shall utilize a full-length rack ground strip, *PANDUIT* series RGS, attached to the rear of the side rail with the thread-forming screws provided to ensure metal-to-metal contact.

Mount an electrostatic discharge (ESD) port kit, *PANDUIT* series RGESD, directly to the rack grounding strip on the back of the rack at approximately 48 inches from the floor. Mount a second RGESD directly to the vertical mounting rail of the rack in the front at approximately the same height. Use the thread-forming screws provided to form a bond to the rack. Place the ESD protection identification stickers directly above the ESD ports.

When the equipment manufacturer provides a location for mounting a grounding connection, that connection shall be utilized. Use the appropriate *PANDUIT* RG series jumper for the equipment being installed and the thread-forming screws provided in the kit.

Use *PANDUIT* part number series RGCBNJ (Common Bonding Network Jumper) to attach the rack ground strip to the mesh CBN. This kit includes the #6 AWG cable with one factory installed two-hole lug and hardware to connect to the busbar and one HTAP to connect to the mesh CBN. In addition, all components can be utilized if your mesh common bonding network is below or overhead. Do not bond racks or cabinets serially. Use the copper compression HTAP that comes with the kit to bond the conductor directly to the mesh common bonding network.

Patch panels will be bonded to racks using the *PANDUIT* bonding screws, part number RGTBSG-C for racks having #12-24 equipment mounting holes, and RGTBSM6G-C for racks having M6 equipment mounting holes.

Retrofit Rack Grounding/Earthing

If the racks already have network equipment installed, it may not be feasible to install the rack ground strip without disrupting data cables. Further, it may be undesirable to disassemble rack hardware to install paint piercing grounding washers, or in some cases, the construction of the rack may make grounding washer installation impossible. In these circumstances, the *PANDUIT* Retrofit Rack Grounding Kits, *PANDUIT* part family RGR, are to be installed.

For retrofit rack grounding/earthing installations, use *PANDUIT* part number RGRKCBNJY to ground/earth the rack to the mesh common bonding network. Use *PANDUIT* part number RGREJ696Y (provided with #6 AWG grounding conductor) or *PANDUIT* part number RGREJ1096Y (provided with #10 AWG grounding conductor) to ground/earth equipment chassis to the rack grounding busbar provided with the RGRKCBNJY as is shown in figure 5 below.

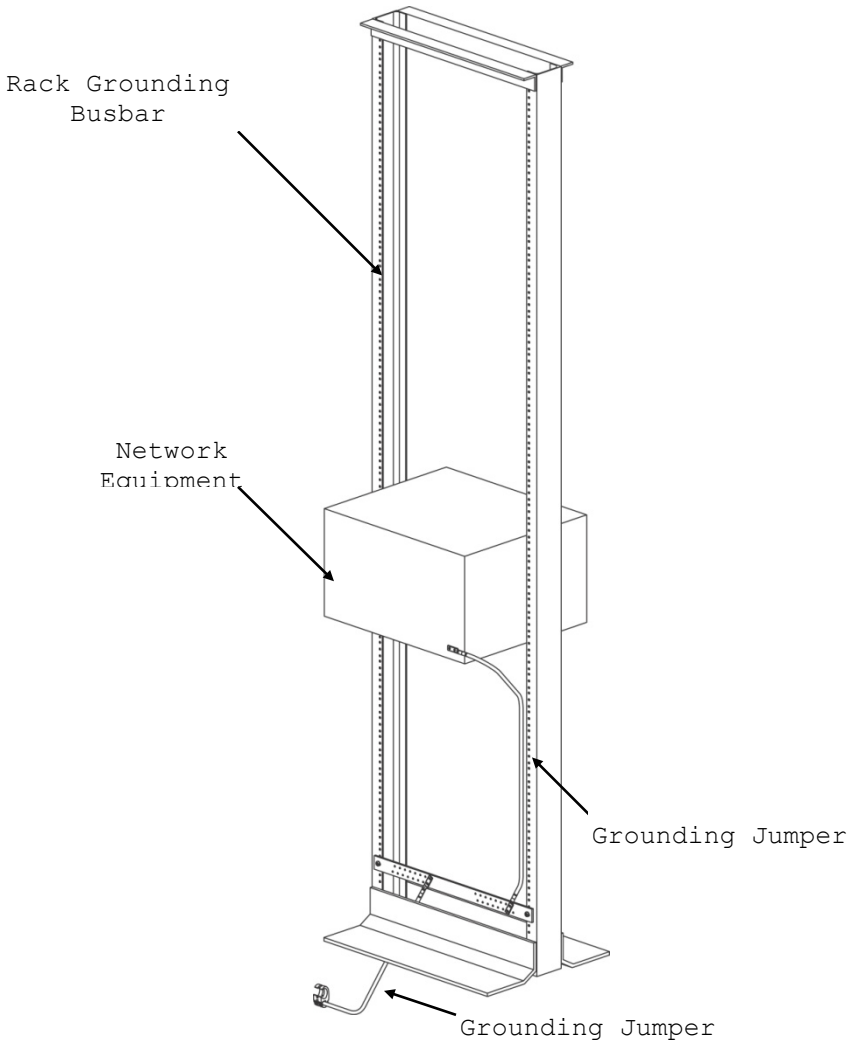


Figure 5 - Retrofit Rack Grounding/Earthing

RGW paint piercing grounding washers are not used in this scenario. Thus, the grounding busbar provides continuity through the vertical channels of the rack, but not the top and bottom of the rack. Thus, wherever practical, the solution using the RGS rack grounding strip and the RGW paint piercing washers shall be used instead of the retrofit rack grounding kits.

All other grounding/earthing requirements apply to retrofit installations without exception.

Cabinet Grounding/Earthing

Non-*PANDUIT* Cabinet Grounding/Earthing

All non-*PANDUIT* equipment and cabinets shall be bonded in accordance with the methods prescribed in ANSI/TIA-942, as is shown in figure 6 below.

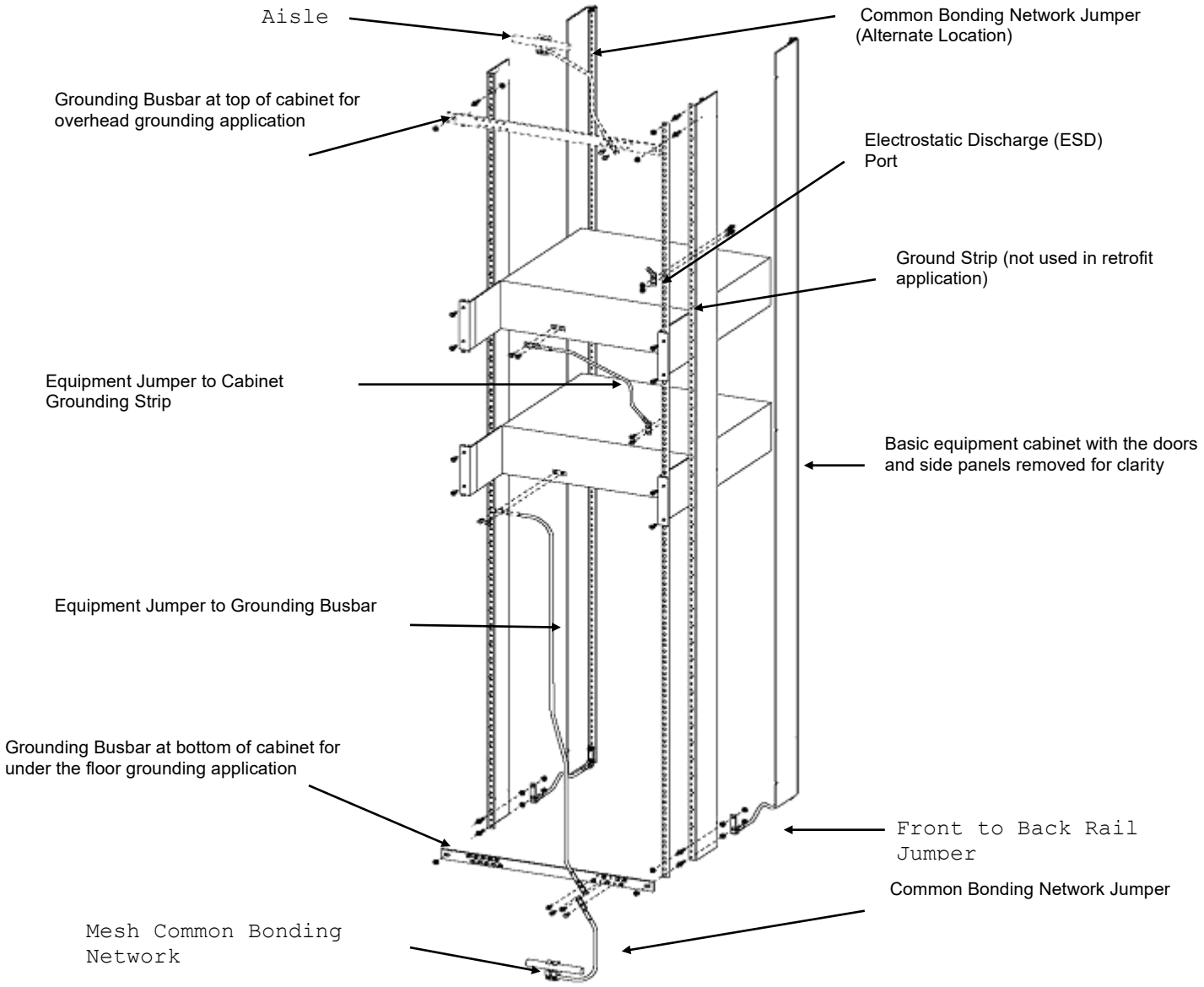


Figure 6 - Properly Grounded/Earthed Cabinet (Back of Cabinet Shown)

To provide electrical continuity between cabinet rails, *PANDUIT* rail jumper kit, series CGJ, shall be used to bond the front and rear equipment mounting rails. It may not be feasible or may be undesirable to disassemble the cabinet to install the paint piercing washers. Using the rail jumper kits is a more cost-effective way to bond the equipment mounting rails together.

All cabinets shall utilize a full-length rack ground strip, *PANDUIT* series RGS, attached to the four mounting rails using the thread-forming screws provided to ensure metal-to-metal contact.

All cabinets shall utilize a copper busbar, *PANDUIT* part number RGRB19U, as a main collection point before connecting to the common bonding network (CBN). The busbar can be mounted at the top or the bottom of the cabinet depending on where the CBN is located.

The copper busbar will then be connected to the CBN utilizing the *PANDUIT* common bonding network jumper kit, part number series RGCBNJ. This kit includes the #6 AWG cable with one factory installed two-hole lug and hardware to connect to the busbar and one HTAP to connect to the CBN. In addition, all components can be utilized if the CBN is below or overhead.

Mount an electrostatic discharge (ESD) port kit, *PANDUIT* series RGESD, directly to the grounding strip on the back of the cabinet at approximately 48 inches from the floor. Mount a second RGESD directly to the grounding strip at the front at approximately the same height. Place the ESD protection identification stickers directly above the ESD ports.

Cabinet equipment mounting rails may utilize cage nuts, threaded holes or thru-hole type mounting fasteners to secure equipment to the rails. Each kit is supplied with the unique thread-forming screws and bonding studs to provide the bond to the equipment mounting rails.

Grounding/Earthing PANDUIT Cabinets

All *PANDUIT*® *NET-ACCESS*™ and *NET-VERSE*™ Cabinets are fully bonded from the factory. Panduit cabinets shall be bonded using one of eight marked bonding landing points on the cabinet frame to the PBB, SBB, TBB or Telecommunications Equipment Bonding Conductor (TEBC) as described in *Rack Grounding/Earthing* section above.

Retrofit Cabinet Grounding/Earthing

If the cabinets already have network equipment installed, it may not be feasible to install the rack ground strips without disrupting data cables. In these cases, the rack ground strip would not be used, and equipment jumpers would be used to make the bond between network equipment and the busbar. See Figure 6 for details.

All other grounding/earthing requirements apply to retrofit installations without exception.

E. Fire stop

A fire stop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Firestop systems comprise an effective block for fire, smoke, heat, vapor, and pressurized water stream.

All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly fire stopped. Firestop systems shall be UL Classified to ASTM E814 (UL 1479) and shall be approved by a qualified Professional Engineer (PE), licensed (actual or reciprocal) in the state where the work is to be performed. A drawing showing the proposed firestop system, stamped/embossed by the PE shall be provided to the Owner's Technical Representative prior to installing the firestop system(s).

F. Labeling

1. All labels shall be mechanically generated using one or more of the below labeling tools:
   - Panduit Easy-Mark Labeling Software to create and print sheet-fed labels on a Laser or Inkjet printer.
   - Panduit Easy-Mark Labeling Software to create and print roll-fed labels on a desktop thermal transfer printer, such as the Panduit TDP43MY or TDP42HY printer. Any desktop printer shall have the below minimum requirements:
     - Resolution: 300dpi
     - Speed: Up to 2" per second
     - Connectivity: USB, Parallel & Serial
     - Web Width: Up to 4"
   - Panduit LS8E or LS9 Handheld Thermal Transfer Printers to create and print cassette-based labels. Any handheld printer shall have the below minimum requirements:
     - Resolution: 203dpi
     - Connectivity (if applicable): USB
     - Label Width: Up to 1"
     - Powered by 6 AA batteries or AC adapter
     - 128 x 64 pixel graphic LCD
     - Weigh less than two pounds with label cassette and batteries installed
     - Cassette-based labels should include ribbon and integrated memory for automatic label formatting
   - Identifiers extracted from electronic CAD files shall utilize Panduit CAD-Connect Software and Easy-Mark Labeling Software in order to generate labels

   All components of the infrastructure shall be labeled, including, but not limited to the following:
   - Copper Cabling shall be labeled with Panduit self-laminating labels, non-laminating labels, or flag labels
   - Fiber Cabling shall be labeled with Panduit Label-Core holders and self-laminating labels, non-laminating labels, or flag labels
   - Cabinets & Racks shall be labeled with Panduit component labels with Super-Tak adhesive
   - Patch Panels and Fiber Enclosures with dedicated label insert locations shall be labeled with Panduit non-adhesive component labels
   - Patch Panels and Fiber Enclosures without dedicated label insert locations shall be labeled with Panduit adhesive component labels
   - Punch-Down Blocks shall be labeled with Panduit adhesive component labels
   - Faceplates with dedicated label insert locations shall be labeled with Panduit non-adhesive component labels
   - Faceplates without dedicated label insert locations shall be labeled with Panduit adhesive component labels
   - All Bonding Busbars shall be labeled with Panduit component labels
   - All Firestops shall be labeled with Panduit component labels
   - Telecommunication Spaces shall be identified with Panduit component labels
   - Electrical Wires shall be labeled using either Panduit printable heat shrink tubing, self-laminating labels, non-laminating labels, or flag labels
   - Large diameter cables or cable bundles shall be labeled with Panduit marker plates applied with either Panduit cable ties or Panduit Tak-Tape
   - Terminal Blocks shall be labeled with Panduit terminal block strip labels
   - Equipment and Panels shall be identified with Panduit component labels and marked with the appropriate safety markings and warnings in accordance with local regulatory requirements
   - Circuit Boards shall be labeled with Panduit polyimide component labels

- Pipes & Conduit shall be labeled with Panduit continuous tapes in the appropriate color and legends in accordance with local regulatory requirements
- Other Safety Identification shall be applied using Panduit pre-printed safety signs/tags or printed on-demand using Panduit component labels in accordance with local regulatory requirements

All network labeling applications shall be performed as described in TIA/EIA-606-B Administration Standard for Commercial Telecommunications Infrastructure.

All data center labeling applications shall be performed as described in TIA/EIA-606-B Administration Standard for Commercial Telecommunications Infrastructure and TIA/EIA-942 Telecommunications Infrastructure Standard for Data Centers.

All electrical labeling applications shall be performed as described in NFPA 70 National Electric Code and any other applicable regulatory codes and standards.

All safety labeling applications shall be performed in accordance with OSHA, NFPA, and any other applicable regulatory codes and standards.

PART 3 - EXCUTION

3.1 Work Area Outlets

Cables shall be coiled in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturers bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. No more than 12” of UTP and 36” of fiber slack shall be stored in an in-wall box, modular furniture raceway, or insulated walls. Excess slack shall be loosely configured and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.

Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-B document, manufacturer's recommendations, and best industry practices.

Pair untwist at the termination shall not exceed 3.18mm (0.125 inch).

Bend radius of the cable in the termination area shall not be less than 4 times the outside diameter of the cable.

The cable jacket shall be maintained to within 25mm (one inch) of the termination point though shall not exceed outside the jack module’s termination cap.

Data jacks, unless otherwise noted in drawings, shall be located in the bottom position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the right-most position(s).

Voice jacks shall occupy the top position(s) on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the left-most position(s).

RJ45 Modular Jacks shall be color-coded per application as follows:
- Network Data: Blue
- Phone Data: White
- Camera Data: Orange
- WAPs: Green, Cat 6A
- Building Automation Systems (BAS): Yellow
- Audio (Speaker, Intercom): Gray

- Fire Alarm/Life Safety: Red

3.2 Horizontal Distribution Cable Installation

Cable shall be installed in accordance with manufacturer's recommendations and best industry practices.

Cables shall be color-coded per application as follows:
- Network Data: Blue
- Phone Data: White
- Camera Data: Orange
- WAPs: Green, Cat 6A
- Building Automation Systems (BAS): Yellow
- Audio (Speaker, Intercom): Gray
- Fire Alarm/Life Safety: Red

A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.

Cable raceways shall not be filled greater than the TIA/EIA-569-A maximum fill for the particular raceway type

Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.

Where transition points, or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.

The cable's minimum bend radius and maximum pulling tension shall not be exceeded.

All horizontal cables shall be secured to Strain Relief Bars using hook & loop ties at the point of termination.

If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 48 to 60-inch (1.2 to 1.5 meter) intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.

Horizontal distribution cables shall be bundled in groups of no more than 25 cables. Cable bundle quantities in excess of 25 cables may cause deformation of the bottom cables within the bundle and degrade cable performance.

Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.

Cables shall not be painted or otherwise sprayed with water or solvent at any time before, during or post installation. Any cables that are found to be in this condition shall be replaced by the Contractor at no cost to the owner.

Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the Contractor shall install appropriate carriers to support the cabling.

Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.

Cables shall be identified by a self-adhesive label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606-A. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.

Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.

Pulling tension on 4-pair UTP cables shall not exceed 25-lbf for a four-pair UTP cable.

3.3 Vertical Outlet Pole and Surface Raceway

A. Vertical outlet poles and Surface Raceway refers to a surface raceway system used for branch circuit wiring and/or data network, voice, video, and other low-voltage cabling. Surface raceway shall be used in solid wall applications or for applications where moves, additions and changes are very typical to the workflow.

B. The raceway system shall consist of raceway, appropriate fittings, and accessories to complete installation per electrical drawings. Non-metallic surface raceway is to be utilized in dry interior locations only as covered in Article 352, part B of the NEC, as adopted by the NFPA and as approved by the ANSI.

C. Equivalent Products - Panduit shall manufacture all raceway products, including but not limited to those listed below. The raceway shall conform to the manufacturing and compatibility requirements listed in appendix E and there will be no substitutions allowed.

3.4 Horizontal Cross connect Installation

Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-B standard, manufacturer's recommendations and best industry practices.

Pair untwist at the termination shall not exceed 3.18 mm (0.125 inch).

Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

All horizontal cables shall be secured to Strain Relief Bars using hook & loop ties.

The cable jacket shall be maintained to within 25mm (one inch) of the termination point though shall not exceed outside the jack module’s termination cap.

Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.5 Optical Fiber Termination Hardware

Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.

Each cable shall be individually attached to the respective fiber enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.

Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.

Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.

A maximum of 12 strands of fiber shall be spliced in each tray. All spare strands shall be installed into spare splice trays.

3.6 Backbone Cable Installation

Backbone cables shall be installed separately from horizontal distribution cables

A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.

Where cables are housed in conduits, the backbone and horizontal cables shall be installed in separate conduits.

Where cables are installed in an air return plenum, riser rated cable shall be installed in metallic conduit.

Where backbone cables and distribution cables are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.

All backbone cables shall be securely fastened to the sidewall of the TR on each floor.

Backbone cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.

Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable.

Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.

3.7 Copper Termination Hardware

Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-A standard, manufacturer's recommendations, and best industry practice.

Pair untwist at the termination shall not exceed 3.18mm (0.125 inch). Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

The cable jacket shall be maintained to within 25mm (one inch) of the termination point though shall not exceed outside the jack module’s termination cap.

Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.8 Racks

Racks shall be securely attached to the concrete floor using minimum 3/8" hardware or as required by local codes.

Racks shall be placed with a 36-inch (minimum) clearance from the walls on all sides of the rack. When mounted in a row, maintain a minimum of 36 inches from the wall behind and in front of the row of racks and from the wall at each end of the row.

All racks shall be bonded to the telecommunications ground bus bar in accordance with Section 2 of this document.

Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.

Wall mounted termination block fields shall be mounted on 4' x 8' x .75" void free plywood. The plywood shall be mounted vertically 12" above the finished floor. The plywood shall be painted with two coats of white fire-retardant paint.

Wall mounted termination block fields shall be installed with the lowest edge of the mounting frame 18" from the finished floor.

3.9 Fire stop System

All firestop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cable system acceptance. The firestop solution must be DHEC approved.

3.10 Grounding System

The TBB shall be designed and/or approved by a qualified PE, licensed in the state that the work is to be performed. The TBB shall adhere to the recommendations of the ANSI/TIA-607-C standard and shall be installed in accordance with best industry practice.

A licensed electrical contractor shall perform installation and termination of the main bonding conductor to the building service entrance ground.

3.11 Identification and Labeling

1. The contractor shall follow the following labeling scheme. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.
    a. MDF/ER closet shall be labeled "A"
    b. IDF/TR closets shall be labeled "B", "C", etc. in sequential order
    c. Racks shall be labeled beginning "1" in sequential order starting left-to-right
    d. Patch Panels shall be labeled "A", "B", etc. top-to-bottom
    e. Permanent Link Cable shall be labeled on both ends (patch panel and work area outlet) per following
        i. "A1E30": MDF/ER closet "A" / rack "1" / panel "E" / port "30"
        ii. "B2C20": IDF/TR closet "B" / rack "2" / panel "C" / port "20"

f. Patch Panels shall also be labeled with the location room number “Rm###” when terminating to an alternate location
    i. Storage Room: “St###”
    ii. Café Floor: “Café FL#”
    iii. Fast Path locations (to be obtained from WCPS Technology Department): “Hall #”
    iv. Gym: “GYM#”

2. All label printing will be machine generated by Panduit PanMark software and Panduit desktop and hand-held printers using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

3.12 Testing and Acceptance

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-B-1 Section 11. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

2. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the PANDUIT® CERTIFICATION PLUS™ System Warranty guidelines and best industry practice, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

B. Copper Channel Testing

All twisted-pair copper cable links shall be tested for compliance to the requirements in ANSI/TIA/EIA/568-B.2 Section 11 for the appropriate Category of cabling installed.

C. Fiber Testing

1. All installed fiber shall be tested in accordance with ANSI/TIA/EIA-568-B.2 section 11.

For horizontal cabling system using multimode optical fiber, attenuation shall be measured in one direction at either 850 nanometer (nm) or 1300 nm using an LED light source and power meter.

Backbone multimode fiber cabling shall be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for single mode) in Both directions.

Test set-up and performance shall be conducted in accordance with ANSI/TIA/EIA-526-14 Standard, Method B.

Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. ONLY PERMANENT LINK TEST IS REQUIRED. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test

method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA/EIA Standard.

Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.

3.13 System Documentation

A. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to the Engineer/End User for approval. Documentation shall include the items detailed in the sub-sections below.

B. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer, the telecommunications contractor shall provide copies of the original test results.

C. The Engineer may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

D. Test Results documentation shall be provided in electronic format within three weeks after the completion of the project. The media shall be clearly marked on the outside front cover with the words “Project Test Documentation”, the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

E. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-B. The appropriate level III tester shall be used to verify Category 6 cabling systems.

F. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the telecommunications contractor may furnish this information in electronic form. The media shall contain the electronic equivalent of the test results as defined by the specification along with the software necessary to view and evaluate the test reports.

G. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

H. The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (DWG, AutoCAD rel.

14) formats on which as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner.

I. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD rel. 14) form

Material List

Manufacturer	Part Number	Description
Panduit	R2P	Standard 19" EIA Aluminum 45RU 2-Post rack with hardware kit and paint piercing bonding kit, numbered up.
Panduit	R4P	Standard 19" EIA Steel 45RU 4-Post rack with hardware kit and paint piercing bonding kit, numbered up.
Panduit	R4PCN	Standard 19" EIA Steel 45RU 4-Post rack with hardware kit and paint piercing bonding kit, numbered up. Note: To achieve OSHPD compliance, use with Part Number R4PAK-OSHPD, Depth: 30 in, Cage Nut Mounting holes.
Panduit	PRV8	45RU 8" wide PatchRunner™ Vertical Cable Manager, dual sided, includes four PRSP7 slack spools
Panduit	PRD8	45RU dual hinged 8" door used with PatchRunner™ Vertical Cable Manager
Panduit	PRV10	45RU 10" wide PatchRunner™ Vertical Cable Manager, dual sided, includes four PRSP7 slack spools
Panduit	PRD10	45RU dual hinged 10" door used with PatchRunner™ Vertical Cable Manager
Panduit	PRV12	45RU 12" wide PatchRunner™ Vertical Cable Manager, dual sided, includes four PRSP7 slack spools
Panduit	PRD12	45RU dual hinged 12" door used with PatchRunner™ Vertical Cable Manager
Panduit	WMPH2E	2RU PatchLink ™ Horizontal Cable Manager with dual hinged cover, front and rear. Includes extended front cover and two bend radius clips.
Panduit	WMP1E	2RU PatchLink ™ Horizontal Cable Manager with dual hinged cover, front and rear.
Panduit	WMPHF2E	2RU PatchLink ™ Horizontal Cable Manager with dual hinged cover, front only. Width: 3.2".
Panduit	WMPF1E	2RU PatchLink ™ Horizontal Cable Manager with dual hinged cover, front only.
Panduit	WMPSE	1RU PatchLink ™ Horizontal Cable Manager with dual hinged cover, front and rear.
Panduit	WMPLSE	1RU PatchLink ™ Horizontal Cable Manager with dual hinged cover, front and rear, short depth.
Panduit	WMPFSE	1RU PatchLink ™ Horizontal Cable Manager with dual hinged cover, front only.
Panduit	WMPLFSE	1RU PatchLink ™ Horizontal Cable Manager with dual hinged cover, front only, short depth.
Panduit	TLBP1R-V	1RU tool-less blanking panel, round hole 19" (483mm) width for tapped rails
Panduit	TLBP1S-V	1RU tool-less blanking panel, square hole 19" (483mm) width for 3/8" cage nut holes (may be used with or without cage nuts installed)
Panduit	TLBP2R-V	2RU tool-less blanking panel, round hole 19" (483mm) width for tapped rails
Panduit	TLBP2S-V	2RU tool-less blanking panel, square hole 19" (483mm) width for 3/8" cage nut holes (may be used with or without cage nuts installed)
Panduit	FLBSIM-51	Full-length blanking shade blanks out 4-51 consecutive rack units on standard 19" (483mm) wide vertical mounting rails

Panduit	UCT3S-X0	Ultra-Cinch™ hook & loop cinch cable tie, 12.0" (305mm) length, .50" (12.7mm) width, nylon hook & loop, nylon cinch ring, black.
Panduit	UCT5S-X0	Ultra-Cinch™ hook & loop cinch cable tie, 18.0" (457mm) length, .85" (21.6mm), width, nylon hook & loop, nylon cinch ring, 10pk, black.
Panduit	PUR6A04GR-UG	Copper cable, category 6A UTP, riser (CMR), 4-pair, conductors are 23 AWG with flame-retardant PE insulation, twisted in pairs, separated by an integrated pair divider, surrounded by a patent-pending MaTriX tape and protected by a flame-retardant PVC jacket. Color: Green
Panduit	PUP6AM04GR-UGA	Copper cable, category 6A U/UTP, plenum (CMP), 4-pair, conductors are 23 AWG with FEP insulation, twisted in pairs, separated by an integrated pair divider, surrounded by an advanced matrix tape and protected by a flame-retardant PVC jacket. Color: Green.
Panduit	CJ6X88TGGR	Category 6A, RJ45, 10 Gb/s, 8-position, 8-wire universal module, Green.
Panduit	UTP28XyyGR	Category 6A Performance, 28AWG, UTP Patch Cord, CM/LSZH. "yy" designates length. Color: Green.
Panduit	PUR6004xx-UY	Copper cable, enhanced category 6 UTP, riser, 4-pair, conductors are 23 AWG, construction with polyolefin (PE) insulation, twisted in pairs, separated by an integrated pair divider, and protected by a flame-retardant PVC jacket, blue. Reel-in-a-box. "xx" designates color.
Panduit	PUP6004xx-UY	Copper cable, enhanced category 6 UTP, plenum, 4-pair, conductors are 23 AWG, construction with polyolefin (PE) insulation, twisted in pairs, separated by an integrated pair divider, and protected by a flame-retardant PVC jacket, blue. Reel-in-a-box. "xx" designates color.
Panduit	CJ688TGxx	Category 6, RJ45, 8-position, 8-wire universal module. "xx" designates color.
Panduit	UTP28SPyyxx	Category 6, small diameter, UTP patch cord with TX6™ PLUS Modular Plugs on each end. "yy" designates length, "xx" designates color.
Panduit	CMBxx-X	Mini-Com® 1-port blank module, reserves space for future use. 10 pc. "xx" designates color.
Panduit	CPP24FMWBLY	24-port flush mount patch panel supplied with rear mounted faceplates.
Panduit	CPP48FMWBLY	48-port flush mount patch panel supplied with rear mounted faceplates.
Panduit	SRB19BLY	Strain relief bar extends 2" off the rack; supports, manages, and provides proper bend radius protection.
Panduit	CFPLyxxY	Single gang, vertical faceplate accepts Mini-Com® Modules with labels. "y" designates # of ports, "xx" designates color.
Panduit	CFPyxx	Single gang, vertical faceplate accepts Mini-Com® Modules. "y" designates # of ports, "xx" designates color.
Panduit	CFPHyxx	Single gang, horizontal faceplate accepts Mini-Com® Modules. "y" designates # of ports, "xx" designates color.
Panduit	CFPSLyxxY	Single gang, sloped vertical faceplate accepts Mini-Com® Modules. "y" designates # of ports, "xx" designates color.
Panduit	CFPHSLyxx	Single gang, sloped horizontal faceplate accepts Mini-Com® Modules with labels. "y" designates # of ports, "xx" designates color.

Panduit	CBXyxx-A	Mini-Com® low profile surface mount box accepts Mini-Com® Modules. "y" designates # of ports, "xx" designates color.
Panduit	FODRX12Y	12-fiber OM3 10 GbE multimode riser rated distribution cable.
Panduit	FODPX12Y	12-fiber OM3 10 GbE multimode plenum rated distribution cable.
Panduit	FOPRX12Y	12-fiber OM3 10 GbE multimode riser rated aluminum interlocking armored cable
Panduit	FOPPX12Y	12-fiber OM3 10 GbE multimode plenum rated aluminum interlocking armored cable.
Panduit	FSDR906Y	6-fiber OS2 singlemode riser rated distribution cable.
Panduit	FSDP906Y	6-fiber OS2 singlemode plenum rated distribution cable.
Panduit	FSPR912Y	12-fiber OS2 singlemode riser rated indoor interlocking aluminum armored cable.
Panduit	FSPP912Y	12-fiber OS2 singlemode plenum rated indoor interlocking aluminum armored cable.
Panduit	FLCDMCXAQY	LC OM3/OM4 multimode duplex connector for 900µm tight-buffered fiber installation. OptiCam pre-polished.
Panduit	FLCDSCBUY	LC OS2 singlemode duplex fiber optic connector for 900µm tight-buffered fiber installation, ferrule type, zirconia ceramic. OptiCam pre-polished.
Panduit	FX2ERQ1Q1SNMyyy	2-fiber OM3 patch cord, LC push-pull to LC push-pull, 1.6mm jacket, riser (OFNR) rated, Standard IL. "yyy" designates length in meters.
Panduit	F92ERLNLNSNMyyy	2-fiber OS2, LC duplex to LC duplex patch cord, riser (OFNR) rated, 1.6mm jacketed cable, Std IL. "yyy" designates length.
Panduit	FCE1U	Holds up to four QuickNet™ Cassettes, FAP adapter panels, or FOSM splice modules. Dimensions: 1.73"H x 17.60"W x 16.30"D (43.9mm x 447.0mm x 414.0mm)
Panduit	FCE2U	Holds up to eight QuickNet™ Cassettes, FAP adapter panels, or FOSM splice modules. Dimensions: 3.48"H x 17.60"W x 16.30"D (88.4mm x 447.0mm x 414.0mm)
Panduit	FCE4U	Holds up to twelve QuickNet™ Cassettes, FAP adapter panels, or FOSM splice modules. Dimensions: 6.98"H x 17.60"W x 16.30"D (177.0mm x 447.0mm x 414.0mm)
Panduit	FWME2	Holds Opticom® Fiber Adapter Panels (FAPs) Dimensions: 12.00"W x 10.18"H x 2.32"D (304.8mm x 258.6mm x 59.1mm)
Panduit	FWME4	Holds up to four QuickNet™ MTP* Cassettes or four Opticom® FAP or FMP panels. Dimensions: 16.11"W x 12.25"H x 3.52"D (409.2mm x 311.0mm x 89.4mm)
Panduit	FWME8	Holds up to eight QuickNet™ MTP* Cassettes or eight OptiCom® FAP or FMP panels. Dimensions: 16.11"W x 20.25"H x 3.52"D (409.2mm x 514.2mm x 89.4mm)
Panduit	FAP6WAQDLCZ	LC 10Gig™ OM3/OM4 FAP loaded with six LC 10Gig™ Duplex Multimode Fiber Optic Adapters (Aqua) with zirconia ceramic split sleeves.
Panduit	FAP6WBUDLCZ	LC OS1/OS2 FAP loaded with six LC duplex singlemode fiber optic adapters (Blue) with zirconia ceramic split sleeves.
Panduit	FAPB	Blank fiber adapter panel – reserves space for future use.
Panduit	J-HOOKS	USE APPROPRIATE PANDUIT J-PRO

Panduit	GB4B0612TPI-1	1/4" x 4" x 12" Grounding Busbar.
Panduit	GB2B0306TPI-1	1/4" x 2" x 12" Telecommunications Grounding Busbars.
Panduit	RGS134-1Y	Grounding strip; 78.65" (2m) length; .67" (17mm) width; .05" (1.27mm) thickness; provided with .16 oz. (5cc) of antioxidant, one grounding sticker and three each #12-24 x 1/2" and M6 x 12mm thread-forming screws.
Panduit	RGS134B-1	Grounding strip; 78.70" (2m) length; .67" (17mm) width; .03" (.76mm) thickness; provided with .16 oz. (5cc) of antioxidant, one grounding sticker, three cage nut bonding studs, eight #12-24 bonding nuts and three strip clips.
Panduit	RGCBNJ660P22	#6 AWG (16mm²) jumper; 60" (1.52m) length; 45° bent lug on grounding strip side; provided with .16 oz. (5cc) of antioxidant, two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws and a copper compression HTAP* for connecting to the MCBN.
Panduit	RGEJ624PFY	#6 AWG (16mm²) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws.
Panduit	RGTBSG-C	Green thread-forming bonding screw, #12-24 x 1/2", 100pk
Panduit	CNB4K	Green bonding cage nut, includes 4 #12-24 bonding cage nuts (.06 – .11 thick panel) and 4 #12-24 x 1/2" bonding screws with #2 Phillips/slotted combo hex head (use 5/16" or 8mm socket). Ideal for patch panel applications.
Panduit	ACG24K	#6 AWG (16mm²) jumper for armored cable diameter up to 0.84" (21.3mm); 24" (609.6mm) length; factory terminated on one end with LCC6 two-hole copper compression lug and the other end with grounding terminal; provided with two each #12-24 and M6 thread-forming screws and a black polypropylene terminal cover.
Panduit	HTWC2-2-1	Kit contains HTCT2-2-1 HTAP and CLRCVR2-1 clear cover, terminates code #2 – #6 AWG STR/SOL Run and Tap 1 or flex #2 – #8 AWG Run and Tap 1, code or flex #8 – #14 AWG Tap 2 and Tap 3.
Panduit	HTWC250-2-1	Kit contains HTCT250-2-1 HTAP and CLRCVR3-1 clear cover, terminates code 250 kcmil – #2 AWG Run or flex 4/0 – #2 AWG Run, code #2 – #6 AWG STR/SOL or flex #2 – #8 AWG Tap 1, code or flex #8 – #14 AWG Tap 2.
Panduit	RGESD2-1	Two-hole ESD port with 5/8" hole spacing, provided with an ESD protection sticker, .16 oz. (5cc) of antioxidant, and two each #12-24 x 1/2" and M6 x 12mm thread-forming screws.
Panduit	RGESDWS	Adjustable fabric ESD wrist strap with 6' coil cord, banana plug, 1 megohm resistor and 4mm snap.
Panduit	BS100645	Braided Bonding Strap, one-hole, insulated, 6.00" length x 1.06" width (152.4mm x 27.0mm).
Panduit	RGEJ1024PFY	#10 AWG (6mm²) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws.

Common Drawings

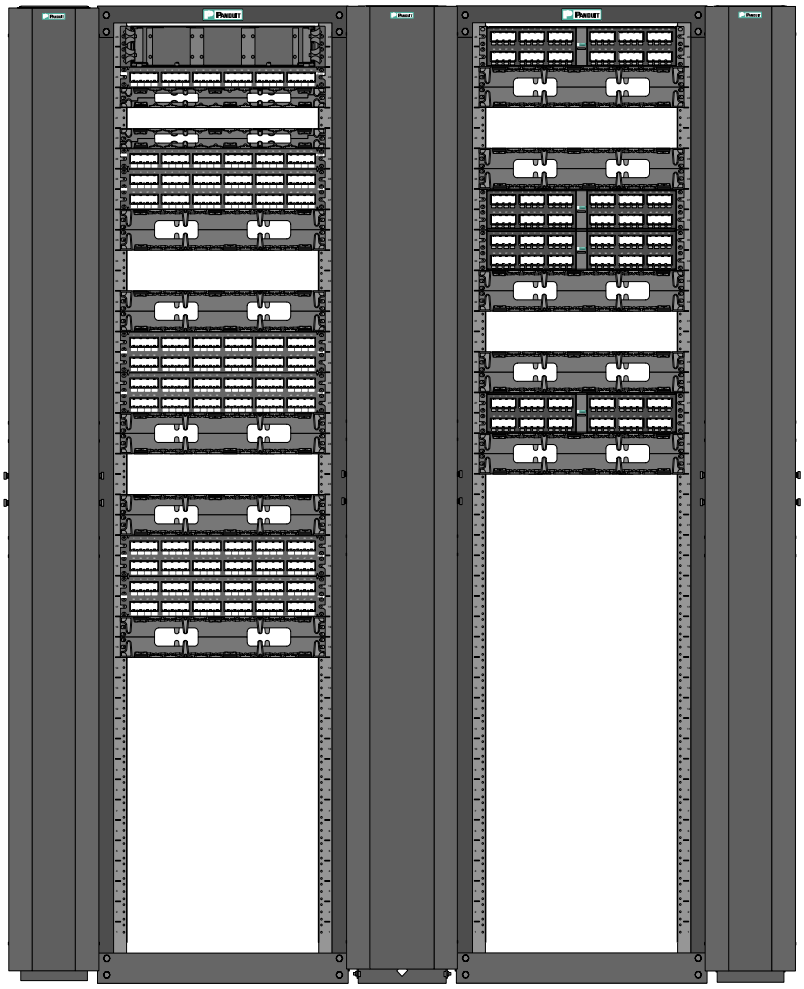


Figure 1: Typical Rack Configuration

END OF SECTION 270610

SECTION 273000 – TELEPHONE SYSTEM

PART 1 – GENERAL:

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, Section 270610 and all other Contract Documents as they apply to his work.

1.2 SCOPE OF WORK

A. The Electrical Contractor shall provide the necessary labor, materials, services, and coordination with the local telephone company to provide the complete telephone system indicated on the plans and specified herein. This work shall include, but is not necessarily limited to:

1. All necessary conduit, panels, voice cable, jacks, boxes, pedestals, etc., as required by the telephone company and the contract documents.
2. Making arrangements with the local telephone company for all work to be performed by them and payment of all charges made by them. The Electrical Contractor shall insure that work to be performed by the phone company is scheduled and accomplished on a timely basis so as not to delay any other parts of the construction.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION

3.1 SYSTEM INSTALLATION

A. The owner shall provide all instruments and equipment for the telephone system.

B. The Contractor shall install conduit system, terminations, devices, cabling, etc. as shown on the plans. Refer to section 270610 for further requirements.

END OF SECTION 273000

SECTION 274133 – MASTER ANTENNA TELEVISION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. All layout and installation of communications infrastructure shall be in accordance with ANSI / TIA 568 and the BICSI TDMM.

D. Each Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section Includes:

1. MATV cabling to Media Retrieval System.

1.3 DEFINITIONS

A. Agile Receiver: A broadband receiver that can be tuned to any desired channel.

B. A/V: Audio/Visual.

C. Broadband: For the purposes of this Section, wide bandwidth equipment or systems that can carry signals occupying in the frequency range of 54 to 1002 MHz. A broadband communication system can simultaneously accommodate television, voice, data, and many other services.

D. Carrier: A pure-frequency signal that is modulated to carry information. In the process of modulation, the signal is spread out over a wider band. The carrier frequency is the center frequency on any television channel.

E. CATV: Community antenna television. A communication system that simultaneously distributes several different channels of broadcast programs and other information to customers via a coaxial cable.

F. CCTV: Closed-circuit television.

G. CEA: Consumer Electronics Association.

H. dBmV: Decibels relative to 1 mV across 75 ohms. Zero dBmV is defined as 1 mV across 75 ohms. dBmV = 20 log 10(V1/V2) where V1 is the measurement of voltage at a point having identical impedance to V2 (0.001 V across 75 ohms).

I. Headend: The control center of the MATV system, where incoming signals are amplified, converted, processed, and combined into a common cable along with any locally originated television signals, for transmission to user-interface points. It is also called the "central retransmission facility."

J. I/O: Input/Output.

K. MATV: Master antenna television. A small television antenna distribution system usually restricted to one or two buildings.

L. RF: Radio frequency.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 COORDINATION

A. Coordinate size and location of raceway system and provisions for electrical power to equipment specified in Divisions 26 and 27.

B. Coordinate Work of this Section with requirements of Cable TV Utility Company. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.8 WARRANTIES

A. INSTALLATION WARRANTY. The Contractor shall warrant the cabling system unconditionally against defects in workmanship for a period of one (1) year from the date of system acceptance. The warranty shall cover all labor and materials necessary to correct a failed portion of the system and to demonstrate performance within the original installation specifications after repairs are accomplished. Replacement of faulty materials and the cost of labor to make the replacement shall be the responsibility of the Contractor.

B. The equipment items shall be supported by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

C. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

D. The Contractor shall provide a system warranty covering the installed cabling system against defects in workmanship, components, and performance, and covering follow-on support after project completion.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with ANSI/TIA-569-C.

B. Cable Trays:

1. Comply with requirements in Division 27 Section "Cable Trays for Communication Systems".

C. Conduit and Boxes: Comply with requirements in Division 26 Sections "Raceways and Fittings for Electrical Systems" and "Cabinets, Outlet Boxes, and Pull Boxes for Electrical Systems".

2.2 CABLING

A. Riser and entrance cabling: minimum .500 non-jacketed coaxial.

2.3 ENCLOSURES

A. Enclosures for Interior, Controlled Environments: NEMA 250, Type 1.

B. Outlet boxes and pathways shall comply with Section 270610.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, roofs, equipment bases, and roof supports for suitable conditions where television equipment is to be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ENTRANCE FACILITIES

A. Install buried entrance pathway complying with Division 26 Section "Raceway and Fittings”.

B. Comply with NECA 1.

C. Comply with BICSI TDMM for layout and installation of communications equipment rooms.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.3 WIRING METHODS

A. Wiring Method: Install cables completely within raceways and cable trays. Conceal raceway except in unfinished spaces.

1. Complete with requirements for raceways and boxes specified in Division 26 Sections "Raceway and Fittings for Electrical Systems” and “Cabinets, Outlet Boxes, and Pull Boxes for Electrical Systems”.
2. Complete with requirements for cable trays specified in Division 27 Section "Cable Trays for Communication Systems".

B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.4 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and ANSI/TIA-569-C.

B. Comply with ANSI/TIA-569-C for pull-box sizing and length of conduit and number of bends between pull points.

C. Install manufactured conduit sweeps and long-radius elbows whenever possible.

D. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays complete around room as shown on drawings. Install cable ladder directly on top of racks and connect to perimeter tray. Refer to drawings for elevation.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 4 inches above finished floor and/or 18” below ceiling structure.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding bar.

E. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints. Provide on all walls.

3.5 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with ANSI/TIA-568-C.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
4. Cables may not be spliced.
5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
9. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. Group connecting hardware for cables into separate logical fields.

D. A pull string shall be installed in all conduits, including those with cables installed. String shall be securely tied off at both ends.

3.6 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

B. Comply with ANSI/TIA-569-C, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.7 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter and Division 27 section "Grounding and Bonding for Communication Systems". Refer to the drawings for interconnections and cable sizes.

B. Comply with ANSI-607-B.

C. Bond metallic equipment to the grounding bus bar, using not smaller than #6 AWG equipment grounding conductor.

1. Bond the shield of shielded cable to the grounding bus bar in communications rooms and spaces.

3.8 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with ANSI/TIA-606-B. The identification scheme shall be coordinated with the owner prior to any labeling or testing.

B. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

C. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of ANSI/TIA-606-B. Furnish electronic record of all drawings, in software and format selected by Owner.

E. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
    a. Individually number wiring conductors connected to terminal strips and identified each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular devices as shown.
    b. Label each unit and field within distribution racks and frames.
3. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware.
4. Both ends of all cable shall be labeled. Labels will be self-laminating, and machine generated. The label shall contain the following information:
    a. The Origination (TR it is feeding from).
    b. The Destination (TR it is feeding).
5. Both ends of all horizontal cables shall be labeled. Labels shall be self-laminating, and machine generated. The cable, workstation faceplate, panel ports and block positions shall be labeled with the room number, location in room, outlet type & #. In rooms with multiple outlets, label clockwise as you enter the room: 1, 2, 3 e.g. a data port at the first drop location to the left of Room 216 door would be (216-1 D1). When terminating workstation cables in the TR, organize and label the cables in numeric room number order at the patch panel.

3.9 Labels shall be self-laminating or computer-printed type with printing area and font color that contrasts with cable jacket color. Handwritten labels will not be acceptable.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect cable jacket materials for NRTL certification markings.
2. Visually confirm marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and labeling of all components.

C. Document data for each measurement.

D. If the cable or termination fails to meet the above requirements, it shall be replaced by the contractor at the contractor’s expense.

E. Prepare test and inspection reports documenting compliance with all requirements of these specifications. Provide three (3) printed copies and two (2) compact disks of all data.

3.11 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 Identification.

3.12 FIELD QUALITY CONTROL

A. Perform continuity test on all cables.

B. Performance testing will be conducted by Cable TV Utility Company. Replace any cable determined to be defective by this testing.

END OF SECTION 274133

SECTION 281643 – ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. This section details product and execution requirements for (Access Control System) Security Management System (SMS) for the project.

B. Work includes furnishing all labor, materials, tools and equipment, and documentation required for a complete turnkey working system as specified in this Section. SMS shall consist of but not be limited to Door Controllers, Card Readers, Sensors, Switches, Conduit, Boxes, Cable, and Wired Devices. Programming and cardholder enrolling are also considered as part of installation as well as coordination with Owners existing systems and Credentials.

C. Unless noted otherwise, "Contractor" shall refer to SMS Integrator & Installer.

D. Communications routing from SMS Server to door controllers shall be via Owner LAN.

1.2 RELATED WORK

A. Related Division 28 Sections include:

1. 260000 – ELECTRICAL
2. 270610 – VOICE AND DATA SYSTEM REFERENCES AND STANDARDS

B. Work under this Section is subject to requirements of General Requirements.

C. Other applicable standards are as follows:

1. UL 294 - Access Control System Units.
2. UL 1076 - Proprietary Burglar Alarm Units and Systems.
3. FCC Rules and Regulations Part 15, Radio Frequency Devices

D. All work and materials shall conform in every detail to rules and requirements of National Fire Protection Association, State and Local Codes, and Industry Standards, and all Industry and BICSI Standards related to DATA Cabling.

E. All materials shall be listed by UL and shall bear UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply, and such items shall bear those labels. Where UL has, an applicable system listing, and label entire system shall be so labeled.

1.3 DEFINITIONS AND ABBREVIATIONS

A. SMS – Security Management System

1.4 WORK BY OWNER

A. Owner shall:

1. Provide list of cardholders for initial SMS programming by Contractor.
2. Provide scheduling of each door, including:
3. Alarm activations and distribution.
4. Door lock and unlock.
5. Cardholder validation by day and time.
6. Delay time of door open alarm.
7. Duration of lock activation upon credential authorization.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. System Design drawings with cable routing, device location and labeling.

C. Operation statements for all SMS doors.

D. Communication Closet layout drawings.

E. Certifications for BICSI and any Industry Organizations.

F. Owner Operation Manuals for all installed equipment as well as documentation of all programing.

G. As built drawings showing cable pathways and routing. As built drawings to also show any changes made to original ESS drawings.

1.6 QUALITY ASSURANCE

A. Security Management System Contractor shall:
   1. Have successfully completed two (2) Security Systems projects in equal magnitude of the system specified in following sections. Contractor shall be an Authorized Dealer and in good standing with the SMS manufacture.
   2. An Authorized Dealer Status letter and a Level 2 Training Certificate from a full-time employee of the contractor will be submitted at time of Bid.
   3. Comply with all certification requirements set out as it relates to the installation of DATA cabling. Specifically, contractor will certify DATA cabling is being installed by BICSI certified installers and installation supervised by a registered in good standing RCDD in the full-time employee of the project contractor.

1.7 GUARANTEE

A. Warranty requirements for Security Management System (SMS) shall be three (3) years on all parts and labor commencing on Date of Substantial Completion. Those requirements apply to all components covered in this section

PART 2 - PRODUCTS

2.1 GENERAL

A. Security Management System shall provide ability to:
   1. Unlock electrified door locks upon authentication of submitted credential to local card readers.
   2. Monitor door alarms and remotely unlock.
   3. Lock doors on an automated schedule from central system.
   4. Unlock doors as required by code via fire alarm relays.
   5. Annunciate intrusion alarms from remote sensors.
   6. Unlock individual doors manually via operator interface.
   7. Lock doors from central Operations Center.

B. System shall include HID Signo Readers that includes Mobile Access/Bluetooth credentials.

C. SMS Software shall be RS2 Technologies. This project is an expansion to the existing system. Provide the correct number of Licenses required for this project.

D. Annual Software Maintenance Fees shall not be acceptable. SMS Software shall be supported by the manufacturer to the authorized reseller at no annual fee. Bidder to provide all technical and software support for 3 years. Software shall continue to operate at current state even if support is not purchased.

E. Reader License charges. There shall be no recurring Reader License Fees required for continued operation of the software.

F. Upgrades or expansion of the SMS to a larger size system in scale shall not require installation of a different and or new SMS application or require the administrator / operator to learn a different and or new interface from the previous version.

G. The SMS shall be written using recognized standard software coding techniques. The SMS shall be written to support multiple languages without re-engineering. The SMS software shall be
written to Microsoft's published standards for User Interface Design, Secure Coding Practices and Database Implementation Guidelines.

H. The SMS software developer shall be a Microsoft Certified Independent Software Vendor.

I. The SMS shall support Server Virtualization. Expansion of the system architecture will allow for end-user deployment based upon their system architectural needs. The SMS shall allow but not require the separation of the database, application server, web server, and client interface.

J. The SMS shall require that all connections to the database are performed through a trusted link from the client or internet browser interface.

K. The SMS shall support web access of applications and functionality using a standard internet browser such as Microsoft Edge, Mozilla Firefox, Google Chrome, Apple Safari, and/or by means of a mobile computing platform using a Tablet PC or Smart Device.
L. The SMS architecture shall support Hot-Standby, Fault Tolerant Servers, Fault Tolerant Hot Standby Servers, and Virtual Servers.
M. The SMS shall be capable of importing or updating Cardholder data using the following source types.
    1. Microsoft Access
    2. Microsoft Excel
    3. Microsoft SQL Server
    4. ASCII Text (delimited file)
N. The SMS shall support
    1. Enterprise or premium equivalent licensing package which accommodates:
    2. Multi- Sites, (Partitioning, or Segmenting)
    3. 1000 System Control Panels (SCP)
    4. Support for 256 Tasks per SCP
    5. 64,000 Access Control Readers, 64 readers per SCP.
    6. 512,000 Inputs, 512 per SCP
    7. 512,000 Outputs 512 per SCP
    8. Supports OSDP devices.
    9. Unlimited Cardholders
    10. Multiple Cards per Cardholder
    11. Greater than 32,000 Access Levels
    12. Multiple Access Levels per Card
    13. Multi Time zone support.
    14. Multi Holiday support.
    15. Elevator Control with Floor Codes
    16. Anti-Pass back with Occupancy Counting
    17. Virtualization Support
    18. Bidirectional Video Integration Support to Milestone VMS, including any required licenses and integration fees for 3 years.
    19. Provide 5 administration concurrent client licenses and support for both web and thin clients.
    20. Biometric Integration Support.
    21. Fully Integrated Graphical Mapping (Floor Plans with Active ICONs)
    22. The ability to Hyperlink recorded video directly from SMS user interface or reports.
    23. Support for Windows Active Directory Authentication.
    24. Dynamic Search capabilities
    25. Lifesafety power integration. Network module is not required as part of this project.
O. SMS Shall have the capability of Lock Integration support for:
    1. ASSA ABLOY
    2. Allegion
    3. Dormakaba.
P. The Access Control System shall use one of the following Operating Systems, Windows Professional, Windows Server of the latest Release.
Q. The SMS shall be capable of utilizing a Web client. The Web client shall be capable of being utilized via any standard Browser to include but not limited to Microsoft Edge, Mozilla Firefox, Google Chrome, Safari.
R. SMS Software Interface shall be capable of tracking Cardholders, Cards, or Readers.
S. SMS Software shall be capable of logging a full audit trail of all changes.
T. SMS shall have the capability of Biometric Integration to:
    1. Allegion
    2. HID
    3. EYELOCK
U. SMS shall have the capability of Integration to: IP - Wireless and POE Locksets. All Integration with wireless lock sets shall be made via the Mercury Hardware.
    1. Allegion

2. Assa Abloy
3. Dormakaba

V. SMS shall have the capability of Integration to: Intrusion Detection Systems
1. Bosch
2. DMP

W. NETWORK SMS

X. The SMS shall communicate with, monitor, and use an open architecture System Control Processor (SCPs) Panel, which shall support 64 controlled openings per panel. This is based on the Mercury Series Three (Red Board) Panels.

Y. The SMS shall be capable of communicating with the SCP using Hardwire (direct RS-232, or RS-485) and TCP/IP network communications.

Z. Each SCP shall be capable of maintaining in its memory a Real-time clock, 256 Holidays, 128 Time Zones each having 12 start\stop Time Intervals, 32,000 Access Levels, 256 Tasks (predefined routines with 256 steps per Task), 8 Card Formats (up to 19-digit card codes, 8 Facility (Site) codes. It shall support Open Supervised Device Protocol (OSDP) multi-drop support with Series 3 Mercury hardware, supports Anti-Pass back (areas, hard, soft, timed, nested), occupancy count rules, device configurations for the devices (Readers, Inputs, Outputs) controlled by the SCP, and a minimum of 50,000 event transactions if the SCP is unable to communicate to the SMS, the SCP stores Card numbers for entry decisions.

AA. The System shall support Input Output (SIO), Reader Interface Modules (RIM), such as the MR-50-S3 single (opening) reader interface, MR-52-S3 dual opening or single opening within out reader interface control, and Single Door MR-62e.

BB. The System shall support Input Output (SIO), 16 dry contact Input modules with 2 Form C output relays, and 16 form C relay Output modules, such as the MR-16IN-S3, or the MR-16OUT-S3.

CC. The SMS shall be capable of utilizing a PVC badge printer having a Windows compliant capable Windows Driver for the Operating System being utilized for the SMS Workstation Software. The SMS shall utilize standard Laser, and Ink jet printers for report purposes having a Windows Driver for the workstation the printer is connected to.

2.2 PROXIMITY CARD READERS

A. Manufacturer: HID.
1. Wall-mount: Model HID Signo 40
2. Mullion-mount Reader Model HID Signo 20

B. Reader(s) shall:
1. Be furnished in Wiegand, or OSDP output model and shall be sealed in a polycarbonate enclosure designed to withstand harsh environments.
2. Unless otherwise specified, reader covers shall be furnished in “black” color – Classic design.
3. Recognize 125 kHz and iClass 13.56 MHz signals
4. Contain an indicator to indicate valid and invalid card
5. Be designed for ambient operating environment.
6. Be powered remotely using centralized power supplies.
7. Read iClass Corporate 1000 sector information
8. Includes built-in Mobile Access/Bluetooth credentials.

2.3 DOOR CONTACTS (DPS / Monitor Points when not included in Door Hardware)

A. Manufacturers: GE Interlogix 1078 Series or approved equal.

2.4 REQUEST-TO-EXIT MOTIONS SENSORS

A. Manufacturer: Bosch DS160 or approved equal

B. Provide door header mounted request to exit motion sensors as indicated on Drawings.

C. Minimum Specifications
1. Detection technology Passive infrared
2. Detection pattern Narrow beam 35-degree cone

3. Output contact normally open contact is closed when sensing zone is entered or exited
4. Power requirements 12 – 24 VDC
5. Mounting: Door header
6. Intergraded sounder with fully adjustable volume up to 85db

D. REX/Sounder to be installed at each exterior door to sound when Door Prop time limit reached
or when door is opened based on preprogramed parameters in the SMS system. Alarm to silence or reset when door is closed and secure or by the SMS system. Coordinate this function with owner at time of system programing.

2.5 ELECTRIC STRIKES (MULLION / FRAME)

A. Manufacturers: Hess, Adams Rite, or approved equivalent.
1. Mullion Mount Strike: Hess 9500 Series or appropriate model for door and frame.
2. Frame Mount Strike: Hess 8000 Series or appropriate model for hardware and frame.

2.6 POWER SUPPLIES

A. As required to support Card Reader(s), Door Controller(s), Strike(s), Electric Door Locks and Hardware, Sensor(s), and other components for fully operational turnkey system. Each component connected to power supplies shall be independently fused with rated fuses to match the manufacturer requirements for each specific device. Power supply cabinets shall have door locks included and keys shall be turned over to Owner at substantial completion. Tamper Sensors shall be included in each Power Supply Cabinet. Power Supply Cabinet shall be at least 30” H x 23” W x 6.5” D and be capable of housing enough space for 4 Mercury Controllers.
1. Manufactures: Lifesafety Pro Wire Series Panels

B. Specialized Electrified Door hardware that requires its own power supplies shall be specified, installed and by Division 08 0000. Each component connected to these power supplies shall be independently fused with rated fuses to match the manufacturer requirements for each specific device. Division 08 contractor to provide connection point for Access Control at a junction box provided and installed by Division 08 0000 contractor located above ceiling as close to door on the secure side as possible. Division 08 contractor to coordinate with Division 26 0000 contractor for power required at that location.

2.7 Video Surveillance Interfaces:

A. The SMS shall be capable of having the following VMS integration interfaces at a minimum.
1. VIDEO SERVER – The SMS shall have the ability to interface to authorized Server units listed below, and to pull live video or recorded video to the SMS. The SMS shall not store or manipulate the video. The SMS shall maintain any and all watermarking, for chain of custody and legal issues.
a. Milestone
b. Salient Systems
c. Genetec
d. Exacqvision

B. Current manufacture and version of software is Milestone XProtect Expert 2020R2. Provide (3) three years of Bidirectional Video Integration Support, including any required licenses and integration fees.

2.8 CABLING

A. General
1. Cable shall be Plenum Rated
2. Cable shall be Access control composite cable

3. Cable must be sized to accommodate calculated voltage drop from power supply to devices.
4. Cable must be sized to accommodate calculated data protocol distances from controller(s) to devices.
5. Manufacture: Belden, Windy City, West Penn, or approved equal
6. Cable must meet the following requirements.
    a. Reader Cable Construction: 18 AWG stranded or as recommended by system manufacturer. Aluminum/Mylar shield with drain wire applied over assembled conductors.
    b. Door Lock Power Cable: Provide and install as required for door hardware Refer to Architectural Door Schedule and Door Hardware documents.
    c. Door Contact/Signal Cable: Construction: 22 AWG twisted, stranded, or as recommended by system manufacturer. Aluminum/Mylar shield with drain wire applied over assembled conductors.
    d. Request-to-Exit Motion Detector Signal Cable: Construction: 20 AWG stranded or as recommended by system manufacturer. Aluminum/Mylar shield with drain wire applied over assembled conductors.
    e. Door Controller Cable (Network Cable): Provide all LAN Cabling, patch cables, jacks, and faceplates per Division 27 0000 specifications.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION COORDINATION

A. Coordinate with Electrical Contractor (Division 260000) that:
    1. Section 280000 provided pathways and equipment back boxes are completed and are coordinated with no conflicts for system installation.
    2. Adequate power has been provided and properly located for security system equipment. Division 28 0000 contractor is responsible for any and all power for the SMS system. Any cost incurred for this power are to be included in the Division 28 0000 Bid.
    3. Code-complying fire alarm relays will be installed for cable termination. Division 28 0000 contractor will provide cable and installation to locations required for connection to Fire Alarm. Contractor is responsible for coordination with Fire Alarm Contractor. Division 28 0000 Contractor shall provide all parts and pieces including all cabling from SMS control panel to Fire Alarm Contact point.
    4. Coordinate scheduling of work to make sure there are no conflicts.
B. Coordinate with Door Hardware supplier (Division 08 0000):
    1. Doors are properly prepared with electric locking hardware and are ready for connection to SMS system.
    2. Locations of all devices prior to installation.
    3. Specialized Electric door Power Supply locations and connections requirements.
C. At a minimum, coordinate the following with Owner:
    1. Owner-provided IP addresses for SMS devices.
    2. Network infrastructure requirements at SMS head-end.
    3. Programming and training for installed system.
D. Coordinate with Construction Manager as required providing a fully functioning turnkey Security system.
E. Coordinate with all trades on the operation and installation of ADA entrance doors with relation to Card Readers and interconnection with door actuator plates, motor units, Fire Alarm System. Contractor will supply any and all associated timer boards or additional parts required for complete operating doors system.

3.2 INSTALLATION

A. General
    1. Provide tamper proof fasteners for all equipment in public areas. Fastener finish shall match equipment finish.

2. Maintain minimum three feet of access in front of class 1 electrical equipment.

B. Delivery, Storage, and Handling
   1. Deliver products to and receive products at site under provisions of General Requirements.
   2. Materials shall be stored according to manufacturer's recommendations at minimum.

C. Equipment
   1. Provide equipment as indicated on Drawings and specified herein. Additional specific installation requirements are as follows:
   2. Door Controllers
      a. Provide Door Controllers in Data Closets as shown on Drawings.
      b. Provide hardwired connection to 120 VAC via conduit or flex conduit. Coordination with Electrical Contractor.
      c. Separate 24 VDC and 120 VAC, wire, cable, and devices by 12” minimum space.
      d. Enclose wire and cable in wire ways or bundle with exiting wire.
      e. Space controllers according to manufacturer’s requirements. Ensure adequate space is allowed for device heat dissipation.
      f. Do not place controller or control devices on enclosure sides.
   3. Card Readers
      a. Provide card readers and card reader devices as shown on Drawings.
      b. Wire card reader LEDs to indicate valid and invalid card reads, and door locked and unlocked conditions. All card reader LED indicators shall operate identically throughout Project. LED shall be red in normal, secured state, and shall be green on valid card read and while door is unlocked.
   4. Electric Locking Mechanics (Door Hardware)
      a. Interface with electric locking mechanics as required by the door hardware.
      b. Provide lock control of electrified locking mechanics through output contacts activated by Door Controller.
   5. Electrified Exit Devices (Door Hardware)
      a. Interface with electrified exit devices as indicated on Drawings. Provide all low-voltage wire and connections between SMS power transfer device and electric locking mechanics, door hardware.
      b. Provide all low voltage power required for electrified door hardware per hardware specifications. Low voltage power supplies to be located in DATA Closets alongside the Door Controllers.
   6. Door Position Switches
      a. Install as shown on drawings.
      b. Double doors will be wired as one door leaf.
      c. Coordinate pathways.
   7. Request-to-Exit Motion Sensors
      a. Provide as shown on drawings.
      b. Coordinate pathways.
   8. Local Door Alarm Sounder
      a. Provide as shown on drawings
      b. Sounder is integrated with Request to Exit Motion Sensors
      c. Coordinate pathways.

D. Fire Alarm Interface (If required per local codes or door types)
   1. Connect (hard wire) door controllers to building fire alarm system for fail-safe release upon any fire alarm. Interface with low voltage / low current normally closed dry contact from fire alarm system provided by fire alarm Contractor (verify exact location in Data Closet for connection with FA). Contact shall open on any fire alarm condition. Provide all additional UL listed fail-safe relays and power supplies necessary to interface to this contact and unlock all fail-secure doors. Coordination Meetings with Fire Alarm Contractor shall be scheduled and coordinated with construction team.

E. Cable Installation
   1. Visually inspect all wire and cable for faulty insulation prior to installation.
   2. Furnish and install all specified wire and cable as required for functioning SMS system. Neatly lace, dress and support cabling. Pull cables in accordance with cable manufacturer's recommendations and ANSI/EEE C2 Standards.
      a. Do not exceed manufacturer's recommended pulling tensions.
      b. Do not install bruised, kinked, scored, deformed, or abraded cable.
      c. Do not splice cable between indicated termination, tap, or junction points.
      d. Remove and discard cable where damaged during installation and replace it with new cable.
      e. Pull all cable by hand unless installation conditions require mechanical assistance.
      f. Loosely coil slack in “Figure-eight” in a manner that prevents kinking.
      g. Loop radius shall be at least 4X minimum bend radius for cable.
      h. Slack length of cable shall be 4 feet (minimum).
      i. Run all wire and cable continuous from device location to final point of termination.
      j. No mid-run cable splices shall be allowed.
      k. Cables shall not be attached to existing cabling, plumbing or steam piping, ductwork, ceiling supports, or electrical or communications conduit.
      l. Cable shall never to laid directly on a ceiling grid or attached in any manner to ceiling grid wires.
      m. Furnish and install all cable such that ample slack is supplied at device terminating end of cable to compensate for any final field modifications at install locations.
      n. Provide code-compliant fire proofing techniques for all penetrations of fire rated partitions and slabs, where penetrations are made by or used for installation of SMS System.
      o. Coordinate routing of wire and cable requiring isolation from power, radio frequency (RF), electromagnetic interference (EMI), telephone, etc. with General Contractor.
      p. At no time, shall any cable be subjected to a bend less than manufacturer’s specified minimum radius.
      q. Provide grommets and strain relief material where necessary to avoid abrasion of wire and excess tension on Wire and Cable.
      r. Make connection with solder-less devices, mechanically and electrically secured in accordance with manufacturers’ recommendations. Wire nuts shall not be an acceptable means of connecting wire and cable.
      s. Utilize conduit and cable trays and or pathways to route SMS cables from each door or device to Door Controller.
      t. No AC current-carrying conductors are allowed in same pathway as signal or low-voltage power cables.
      u. Wire and cable within Door Controllers, enclosures and or other security enclosures shall be neatly installed, completely terminated, pulled tight with slack removed and
         outed in such a way as to allow direct, unimpeded access to equipment within enclosure.
      v. All wire and cable shall be bundled and tied. Ties shall be similar to T&B TyRap cable ties.
      w. Use of electrical tape on connections or cabling shall not be acceptable.
      x. Wire nuts shall not be an acceptable means of connecting wire and cable.
      y. All system cabling within vertical risers (as required) shall be bundled, wrapped, and tied to structure at three-meter intervals in order to isolate it from other wire and cable within riser.
      z. Provide all personnel and equipment necessary to install and support cable.
      aa. All equipment shall be UL listed for the application.

bb. Furnish and install all SMS wire and cable including DATA cabling.

F. Power Supplies / AC Power
   1. 120 VAC power dedicated to security system shall be on Emergency Generator Power, (If available).SMS Servers shall be on properly sized UPS units on Emergency Generator backup circuits where available. If Generator is not available UPS or Battery Backup should provide at minimum 1-Hour Full Operation of SMS Server system upon normal power failure.
   2. Connect all AC power with provided UL listed power supplies and transformers to distribute low voltage power to system components as required.
   3. Provide hinged UL Listed terminal cabinets with Tamper Switched for all power supplies, transformers, and power distribution terminal strips. Provide all conduit and wiring from AC power facilities to terminal cabinets.
   4. Provide protection against spikes, surges, noise, and or line problems for all system equipment and components.
   5. Provide protection on all exterior, control, power, signal cables and conductors against power surges. Each surge protector shall be UL Listed.
   6. If on instance, shall any UL labeled door or frame be drilled, cut, Penetrated, or modified in any way. Contractor shall be responsible for replacing any labeled door or frame that is modified without written approval from Owner or Project Engineer.
   7. Label all controls as necessary to agree with their function.
   8. Label all wire and cable in common at both ends using a permeant method such as self-laminating cable marking tape.
   9. Tags shall be attached to wire and cable nylon cable ties in an accessible location so that they can be easily read.
   10. Tags shall be installed when wire and cables are installed.
   11. Labeling shall be consistent with existing cable labeling system and agree with Record Documentation.
   12. Place wire identification numbers at each end of conductor involved by using sleeve type, heat shrinkable markers. Markers shall be installed so as to be readable from left to right or top to bottom.
   13. Mark all connector with common designation for mating connectors. Connector designation shall be indicated on Record Drawings.
   14. Coil all spare conductors in device back box, panel wire way, or top of panel where wire way is not provided. Conductors shall be neatly bundled and tagged.
   15. Install integrated security and communication systems in accordance with manufacturer's instructions at locations indicated on the Drawings.
   16. Mount equipment plumb, level, square, and secure.

3.3 DEMONSTRATION AND TRAINING

A. Coordinate with Owner to establish schedule for required training. Provide at least eight (8) hours training. Training should include Administrator level training in addition to User Level training. Video record all training and provide said recordings to Owner in DVD, or flash drive format.

B. Contractor shall be on call during Warranty period to answer any questions Owner might have. The Owner reserves the right to use any excess training hours, not used by time of system completion, for future training as requested by Owner until total number of training hours has been used.

C. Demonstrate that integrated security and communication system functions properly. Perform demonstration at final system inspection by qualified representative showing system is fully functional on all features.

3.4 SYSTEM START-UP

A. Start-up includes all Contractor-Furnished, Contractor-Installed (CFCI) systems and equipment.

B. Work shall be complete and ready to operate prior to final acceptance.

C. All programming for systems up to inaugural day of beneficial use of Security System shall be coordinated thru Owner.

D. Adjust integrated security and communication system for proper operation in accordance with manufacturer's instructions.

3.5 SYSTEM ACCEPTANCE

A. Final acceptance testing of Work will be coordinated and observed by Owner and or Owner representatives.
B. Prior to testing, Contractor shall submit two sets of preliminary (draft) Record Drawings to Owner. Preliminary Record Drawings are to be used by Owner to conduct system final test.
C. At completion of Work, remove all waste materials, rubbish, Contractor's and subcontractors' tools, construction equipment, machinery, and all surplus materials.

3.6 WARRANTY

A. SMS Software and Devices Warranty. The SMS System shall be warranted for a period of 3 years from the date of final completion and owner acceptance. System to be free of defects and will function in accordance with this specification. SMS Devices shall be warranted for a period of three (3) years from the date of substantial completion an owner acceptance. System will be free from defects and will function in general accordance with this specification and the product specifications.

3.7 PROTECTION

A. Protect installed integrated security and communication system from damage during construction, both physically and electrical surges.

END OF DOCUMENT 281643

SECTION 282000 – VIDEO SURVEILLANCE

PART 1 -GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

D. Division 26 - Electrical

1.2 WORK INCLUDED

A. Conduit system and conduit sleeves, for connections to Owner furnished CCTV cameras, mounts, and electronics for Electronic Surveillance System.

B. The electronic surveillance system shall consist of a conduit system, conduit sleeves, as indicated. All cameras, electronics, and software will be Owner furnished and installed.

C. Division 28 Contractor shall provide homerun conduit from each exterior camera to nearest J-hook path, cable tray path or MDF/IDF. Provide conduit in all open ceiling areas.

D. Provide one (1) CAT 6 cable from each camera location to nearest MDF/IDF. Test cable and provide 20’ whip at each end. Route in conduit. J-hooks are acceptable where above lay-in ceiling.

PART 2 -PRODUCTS – Not Used.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Division 26 Contractor shall provide all conduits, junction boxes, and materials required for the installation of a conduit system, conduit sleeves, and raceways. Any material and/or equipment necessary for the proper operation of the system not specified or described herein shall be deemed part of this specification.

END OF SECTION 282000

SECTION 283100 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

C. Each Contractor's attention is directed to Section 280501 - General Provisions, Communications, and all other Contract Documents as they apply to his work.

1.2 DEFINITIONS

A. LED: Light-emitting diode.

B. NICET: National Institute for Certification in Engineering Technologies.

1.3 SCOPE OF WORK

A. The work covered by and the intent of this section of the specifications includes the furnishing of all labor, equipment, materials, testing, programming, and performance of all operations in connection with the installation of the Fire Alarm System as shown on the drawings, as herein specified, and as required by the applicable codes.

B. The complete installation shall conform to the applicable sections of KBC 909.8, NFPA-71, NFPA-72A, B, C, D, NFPA 92 & 92B, Local Code Requirements and National Electrical Code (Article 760). The requirements of any local fire department and the Authority Having Jurisdiction shall also be observed in the system installation and device layout. The complete installation shall satisfy all applicable codes and standards for locations, coverage, alarm sequence, etc. Provide all components as required for a complete and operational system per UL, NFPA, ADA, and all applicable local and state regulations.

C. Furnish and install a peer-to-peer network intelligent addressable multiplex fire alarm system as a complete system as described herein and as shown on the plans; to be wired, connected, completely tested, and left in first class operating condition. The system shall use individually addressable digital multiplex devices, communicating on a Class “B” Signal Line Circuit(s) (SLC) with individual device supervision, appliance circuit supervision, SLC loop isolation when called for, and incoming normal and stand-by power supervision. In general, systems shall include a control panel, manual pull stations, automatic fire detectors, speakers, flashing strobe lights, annunciator(s) (if indicated), raceways, all wiring, connections to devices, connections to valve tamper switches, water flow switches and mechanical controls, outlet boxes, junction boxes, protective covers, and all other necessary materials for a complete, operating fire alarm system.

D. Fire Alarm Control Panel Spare capacity: For new systems, the FACP system shall not exceed 80% of its rated capacity on its address SLC loop, indicating and supervisory lines, allowing for 20% spare capacity for future growth.

E. The work included in this section shall be coordinated with related work specified elsewhere in these specifications.

F. The fire alarm control panel shall allow for loading or editing of any special instructions or operating sequences as required. No special tools, chips, modems, or an off-board programmer shall be required to program the system to facilitate future system expansion, building parameter changes, or changes as required by local codes. All instructions shall be stored in a resident non-volatile programmable memory. Provide three disk copies of final panel program at close of project, to be included in with the operation and maintenance manuals.

G. All panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name of each component. The devices specified under this section constitute the type, quality of design, materials, and operating features desired.

H. The listing of specific catalog numbers and equipment parameters is not intended to limit competition among other manufacturers that propose to supply equivalent equipment and services. Acceptable manufacturers for Fire alarm systems are:

1. Fire Lite
2. Simplex
3. Edwards EST
4. Notifier

I. Provide a one (1) year contract with Security Central, 316 Security Drive, PO Box 5759, Statesville, NC, 28687 for each system. Phone number is 1-800-438-4171. Contact is Stewart Richey.

J. Device colors/finishes shall be white or selected by the Architect.

K. Equipment submissions for shop drawing review must include a minimum of the following:

1. Complete descriptive data indicating UL listing for all system components.
2. Complete sequence of operations of the system.
3. Complete system wiring diagrams for components capable of being connected to the system and interfaces to equipment supplied by others.
4. A copy of any state or local Fire Alarm System equipment approvals.
5. An AutoCAD (latest version) produced wiring diagram illustrating the basic floor plan of the building, showing all system wiring and equipment, as well as zoning boundaries and schedule of zone legends as intended to appear on annunciators. Provide three CD-Rom copies of as-built drawings and all system operational software at close of project, to be included in operation and maintenance manuals.

L. No work shall be done until the drawings are approved by the Kentucky Department of Housing, Buildings and Construction.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
6. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

C. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.

2. Shop Drawings shall be prepared by persons with the following qualifications:

    a. Trained and certified by manufacturer in fire-alarm system design.
    b. NICET-certified fire-alarm technician, Level IV minimum.
    c. Licensed or certified by authorities having jurisdiction.

D. Delegated-Design Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. Deliver copies to authorities having jurisdiction and include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:

    a. Frequency of testing of installed components.
    b. Frequency of inspection of installed components.
    c. Requirements and recommendations related to results of maintenance.
    d. Manufacturer's user training manuals.

5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
3. Smoke Detectors: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
4. Detector Bases: Quantity equal to 2 percent of amount installed, but no fewer than 1 unit.
5. Keys and Tools: One extra set for access to locked and tamper proofed components.
6. Audible and Visual Notification Appliances: Two (2) of each type installed.
7. Fuses: Two of each type installed in the system.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: All work specified in this section shall be performed by a technician certified in the state/local jurisdiction (NICET Level IV certified). Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Each and all items of the intelligent Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer. Exception as needed of: Door holders, keyed institutional pull stations, sprinkler water flow and tamper switches. All fire alarm devices used within the system shall be listed for fire alarm service under the appropriate category by the Underwriters' Laboratories, Inc. (UL), and shall bear the "U.L." label.

E. Every component, device, transmitter, software, etc., that are included in the work, to make up a complete Fire Alarm System shall be listed as a product by the manufacturer under the appropriate category by the Underwriters' Laboratories, Inc. (UL), and shall bear the "U.L." label.

F. The system power, signal and controls wiring shall be UL listed for Power Limited Applications per NEC 760. All circuits shall be marked in accordance with NEC Article 760.

1.9 WARRANTIES

A. The Contractor shall unconditionally guarantee (except for vandalism) the completed fire alarm system wiring and equipment to be free from inherent mechanical, software and electrical defects for a period of one (1) year from the date of Owner’s acceptance.

B. The equipment manufacturer shall make available to the Owner a maintenance contract proposal to provide a minimum of two (2) inspections and tests per year in compliance with NFPA-72H and NFPA-92B guidelines.

C. Installation Warranty: The Contractor shall warrant the cabling system unconditionally against defects in workmanship for a period of one year from the date of system acceptance. The warranty shall cover all labor and materials necessary to correct a failed portion of the system and to demonstrate performance within the original installation specifications after repairs are accomplished. Replacement of faulty materials and the cost of labor to make the replacement shall be the responsibility of the Contractor.

D. The equipment items shall be supported by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

E. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

1.10 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two (2) years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two (2) years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide thirty (30) days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 OPERATION:

A. Under normal condition the front panel shall display a SYSTEM NORMAL message and the current time and date.

B. The system alarm operation subsequent to the alarm activation of any manual station, automatic detection device, or sprinkler flow switch shall be as follows:

1. The appropriate initiating device circuit indicator (red color) shall flash on the control panel until the alarm has been silenced at the control panel. Once silenced, this same indicator shall latch on. A subsequent alarm received after silencing shall flash the subsequent zone alarm indicator on the control panel and resound alarms and flashing signals. These same conditions shall occur at any remote annunciator.
2. A pulsing alarm tone shall occur within the control panel until silenced.
3. All alarm indicating appliances shall sound in a temporal code pattern until silenced by an alarm silence switch at the control panel (or the remote annunciator, if any).
4. All doors normally held open by door control devices shall close. Doors shall also be released in the event of incoming normal power failure.
5. A supervised signal to notify the local fire department or an approved central station (as required by local codes) shall be activated.
6. A supervised signal sent to the mechanical control system(s) shall activate, shut down or reconfigure the air handling systems as required by NFPA or as otherwise indicated herein. Provide necessary interlock wiring as required to control mechanical equipment.
7. The Contractors shall coordinate with each other as necessary to provide all required auxiliary contacts, DDC systems interfaces, equipment, etc., as needed to shut down or otherwise control air handling systems per NFPA and all applicable codes.
8. The system shall be wired with two circuits to all Notification devices so that when an alarm is acknowledged, silencing the audibles, the visual units shall continue in operation until the main control panel has been reset. If local codes require other than this arrangement, the system shall be wired in accordance with the code that is applicable.

C. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory, or Trouble) shall flash. The panel audible signal shall pulse for alarm conditions and sound steadily for trouble and supervisory conditions.

D. The panel shall display the following information relative to the abnormal condition of a point in the system:

1. Custom location label (80-character LCD display minimum)
2. Type of device (i.e., smoke, pull station, water flow)
3. Point status (i.e., alarm, trouble)

E. Pressing the appropriate acknowledge button shall acknowledge the alarm or trouble condition. The acknowledge functions may be passcode protected if the user has insufficient privilege to acknowledge such conditions. A message shall indicate insufficient privilege but allow the user to view the points without acknowledging them. Should the user have sufficient privilege to acknowledge, a message will be displayed informing the user that the condition has been acknowledged. Systems not capable of password protected manual command operations shall provide key operated switches for these functions. Function key switches shall be keyed differently from any other keyed switches or locks used within the system.

F. After all the points have been acknowledged, the LEDs shall glow steady, and the panel audible signal will be silenced. The total number of alarms, supervisory, and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be indicated.

G. Alarm Silencing:

1. Should the Alarm Silence button be pressed all alarm signals shall cease operation.
2. Signals shall not be silenced during alarm silence inhibit mode.

H. System Reset:

1. The System Reset button shall be used to return the system to its normal state after an alarm condition has been remedied. The display shall step the user through the reset process with simple English language messages. Messages shall provide operator assurance of the sequential steps (i.e.: IN PROGRESS, RESET COMPLETED, and SYSTEM NORMAL) as they occur, should all alarm conditions be cleared.
2. Should an alarm condition continue to exist, the system will remain in an abnormal state. System control relays shall not reset. The panel audible signal and the Alarm LED shall be on. The display will indicate the total number of alarms and troubles present in the system along with a prompting to review the points. These points will not require acknowledgment if they were previously acknowledged.
3. Should the Alarm Silence Inhibit function be active, the System Reset key press will be ignored and a RESET INHIBITED message will be displayed for a short time to indicate the action was not taken. For operator assurance, a RESET NO LONGER INHIBITED message will be displayed when the inhibit function times out.

I. Function Keys:

1. Additional function keys shall be provided to access status data for all system points. As a minimum the status data shall include Disable/Enable Status, Verification Tallies of Initiating Devices, Acknowledge Status, etc.

J. History Logging:

1. In addition to any required printer output, the control panel shall have the ability to store a minimum of three hundred (600) events in an alarm log plus a minimum of three hundred (600) events in a separate trouble log. These events shall be stored in a battery protected random access memory (RAM). Systems not having discrete alarm and trouble logging memory shall include an alternate supervised (e.g.: disc drive, tape cassette) historic recording method with battery backup. Real time and date shall accompany all history event recording.

K. Walk Test with History Logging:

1. The system shall be capable of being tested by one person. While in testing mode, the alarm activation of an initiating device circuit shall be silently logged as an alarm condition in the historical data file. The panel shall automatically reset itself after logging of the alarm.
2. The momentary disconnection of an initiating or indicating device circuit shall be silently logged as a trouble condition in the historical data file. The panel shall automatically reset itself after logging of the trouble condition.
3. Optionally, the walk test sequence will have the capability of activating the alarm indicating appliances for a maximum of 2 seconds to signal a unique code associated to the alarm device. If this option is selected, any momentary opening of an initiating or indicating appliance circuit wiring shall cause the alarm indicating appliances to sound for 4 seconds to indicate the trouble condition.
4. Should the walk test feature be on for an inappropriate programmable amount of time, it shall revert to the normal mode automatically.
5. The control panel shall be capable of supporting up to eight (8) separate testing groups whereby one group of points may be in a testing mode and the other (non-testing) groups may be active and operate as programmed per normal system operation. After testing is considered complete, testing data may be retrieved from the system in chronological order to ensure device/circuit activation. Should an alarm condition occur from an active point, not in walk test mode, it shall perform all standard programmed alarmed sequences.

6. Suppliers of systems not having this feature as functionally specified above shall include a testing agreement meeting the requirements of NFPA-72H in their base bid quotation. As a minimum, two (2) years of scheduled testing shall be included.

L. LED Supervision:

1. All slave module LEDs shall be supervised for burnout or disarrangement. Should a problem occur, the panel shall display the module and the LED location numbers to facilitate location of that LED.

M. System Trouble Reminder:

1. Should a trouble condition be present within the system and the audible trouble signal silenced, the trouble signal shall resound at preprogrammed time intervals to act as a reminder that the fire alarm system is not 100% operational. Both the time interval and the trouble reminder signal shall be programmable to suit the owner's application.

N. Access Levels:

1. There shall be a minimum of four (4) access levels. Passcodes shall consist of up to ten (10) digits. Changes to passcodes shall only be made by authorized personnel. Systems not capable of password protected manual command operations shall provide key operated switches for these functions. Function key switches shall be keyed differently from any other keyed switches or locks used within the system.
2. In order to maintain security when entering a passcode, the digits entered will not be displayed. All key presses will be acknowledged by a local audible momentary tones.
3. When a correct passcode is entered, an ACCESS GRANTED message shall be displayed. The new access level shall be in effect until the operator leaves the keypad inactive for ten (10) minutes or manually logs out.
4. Should an invalid code be entered, the operator shall be notified with a message and shall be allowed up to three chances to enter a valid code. After three unsuccessful tries, an ACCESS DENIED message shall be displayed.
5. Access to a level will only allow the operator to perform all actions within that level and all actions of lower levels, not higher levels.
6. The following keys/switches shall have access levels associated with them:

    a. Alarm Silence
    b. System Reset
    c. Set Time/Date
    d. Manual Control
    e. On/Off/Auto Control
    f. Disable/Enable
    g. Clear Historical Alarm Log
    h. Clear Historical Trouble Log
    i. Walk Test
    j. Change Alarm Verification

7. Acknowledge keys shall also require privileged access to acknowledge points. If the operator presses an acknowledge key with insufficient access, an error message will be displayed. The points will scroll with each key press to view the points on the list, but the points will not get acknowledged in the database.

O. The alarm indicating appliances shall be capable of being silenced only by authorized personnel operating the alarm silence switch at the main control panel or by use of a similar key operated switch at the remote annunciator (where remote units are provided). A subsequent alarm shall reactivate the signals. Operation of the alarm silence switch shall be indicated by trouble light and audible signal.

P. The alarm activation of any elevator lobby shaft, pit or equipment room smoke detector shall, in addition to the operations listed above, cause the elevator cabs to be recalled according to the following sequence:

1. If the alarmed detector is in any location or on any floor other than the main level of egress, the elevator cars shall be recalled to the main level of egress.
2. If the alarmed detector is on the main egress level elevator lobby, the elevator cabs shall be recalled to the pre-determined alternate recall level.
3. Provide auxiliary contacts within the base of each elevator lobby smoke detector, with each separate landing to be wired back separately to the elevator controller. Coordinate all equipment terminations and sequence of operation with the elevator installer. The use of digital to analog controllers to accomplish this function will be acceptable, if in compliance with codes.

Q. The activation of any standpipe water valve tamper switch or sprinkler zone valve tamper switch shall activate a distinctive system supervisory audible signal and illuminate a "Sprinkler Supervisory Tamper Switch" indicator at the system controls (and the remote annunciators). There shall be a distinction in the audible trouble signals between valve tamper switch activation and opens or grounds on fire alarm circuit wiring.

1. Activating the trouble silence switch will silence the supervisory audible signal while maintaining the "Sprinkler Supervisory Tamper" indicator showing the tamper contact is still activated.
2. Restoring the valve to the normal position shall cause the audible signal and visual indicator to pulse at a fixed rate.
3. Activating the trouble silence switch shall silence the supervisory audible signal and restore the system to normal.

R. The alarm activation of any duct mounted smoke detector shall cause the control panel to indicate and report a supervisory trouble only. It shall not sound the general building alarm. It shall initiate an HVAC system shutdown as described herein.

S. A manual evacuation switch shall be provided to operate the system indicating appliances and/or initiate "Drill" procedures.

T. Activation of an auxiliary bypass switch shall override the automatic functions either selectively or throughout the system and initiate a trouble condition at the control panel.

U. Include any and all detection equipment and interface relays as required to provide a 100% code approved and supervised pre-action Fire Suppression system. Coordinate with the Fire Protection installer as required.

2.2 ALARM SEQUENCE:

A. The system alarm operation subsequent to the alarm activation of any manual station, automatic detection device, or sprinkler flow switch is to be as follows:

1. All audible alarm indicating appliances (speakers) shall sound a continuous fire alarm signal in the building until silenced by the alarm silence switch at the control panel. Should a paging announcement be in progress the program hierarchy shall disconnect to paging announcement as activate the alarm signal as defined above.
2. All visible alarm indicating appliances Strobes shall display a temporal pattern in the building until extinguished by the Alarm Silence Switch.
3. All electric locks shall be released via interface to door locking system.
4. Activate digital alarm communicator to call UL Listed Central Station for notification to local fire department.
5. Annunciate alarm device on remote annunciator.
6. Activation of a smoke sensor from an elevator lobby, machine room, or shaft shall in addition to the above sequences; initiate fireman’s recall service of elevator via programmable addressable control relay.
7. Activation of elevator machine room or shaft heat detector shall in addition to the above sequences; initiate elevator shunt trip via programmable addressable control.

B. The control panel is to have a dedicated supervisory service LED and a dedicated supervisory service acknowledge switch.

1. The activation of any standpipe or sprinkler valve tamper switch shall activate the system supervisory service audible signal and illuminate the Supervisory LED at the control panel [and the remote annunciator]. Differentiation between valve tamper activation and opens and/or grounds on fire alarm initiation circuit wiring shall be provided.
2. Activating the Supervisory Service Acknowledge Switch will silence the supervisory audible signal while maintaining the Supervisory Service LED on indicating the tamper contact is still in the off-normal state.
3. Restoring the valve to the normal position shall cause the Supervisory Service LED to extinguish thus indicating restoration to normal position.
4. Alarm and trouble conditions shall be immediately displayed on the control panel front Alphanumeric display as well any applicable remote annunciators. If more alarms or troubles are in the system, the operator may scroll to display new alarms.
5. The system shall have an alarm list key that will allow the operator to display all alarms, troubles, and supervisory service conditions with the time of occurrence. This shall allow for the determination of not only the most recent alarm but also may indicate the path that the fire is taking.

2.3 SUPERVISION

A. The system shall contain Style "4" SLC addressable initiation circuits per area/floor as required. A SLC loop shall be so arranged that a fault in any one addressable loop shall not affect any other loop. If one SLC circuit serves more than one floor, each floor shall utilize an isolator per floor (per manufacture specs for isolator use) If the SLC wiring leaves the building, it shall have an isolator and be surge protected with the appropriate device per the NEC. The alarm activation of any initiation circuit shall not prevent the subsequent alarm operation of any other initiation circuit.

B. Supervisory initiation circuit(s) shall be wired Class “B” from addressable modules as required, for connection of all sprinkler valve tamper switches. If the Class “B” wiring leaves the building, it shall be surge protected with the appropriate device per the NEC. Wiring methods which affect any fire alarm initiation circuits to perform this function shall be deemed unacceptable, i.e.: sprinkler and standpipe tamper switches (N/C contacts) shall NOT be connected to circuits with fire alarm initiation devices (N/O contacts). These independent initiation circuit(s) shall be each labeled "Sprinkler Supervisory Tamper Switch" and shall differentiate between tamper switch activation and wiring faults. Provide individual annunciation for each tamper switch as indicated by the zoning schedule on the plans or as otherwise indicated.

C. There shall be independently supervised and independently fused indicating appliance circuits as required for alarm audible signals and flashing alarm lamps. If remote NAC power extenders are used, a single indicating appliance circuit or module will be used to drive remote NAC(s), with device label as to the NAC’s physical location.

D. When building smoke control is called for, all auxiliary manual controls shall be supervised so that all switches must be returned to the normal (automatic) position to clear system trouble. Each independently supervised circuit shall include a discrete (amber color) "Trouble" indicator to display status condition per each circuit.

E. All auxiliary manual controls shall be supervised so that all switches must be returned to the normal (automatic) position to clear system trouble.

F. Each independently supervised circuit shall include a discrete (amber color) "Trouble" indicator to indicate disarrangement conditions, per each circuit.

G. The incoming power to the system shall be supervised so that any power failure shall be audible and visually indicated at the control panel and the annunciator. A green color "power on" indicator shall be displayed continuously while incoming power is present.

H. The system batteries shall be supervised so that disconnection or failure of a battery shall be audibly and visually indicated at the control panel (and the annunciator).

I. Wiring to a remote annunciator (if provided for system) shall be supervised for open and ground conditions. An independent annunciator trouble indicator shall be activated, and an audible trouble signal shall sound at the control panel.

2.4 FIRE ALARM CONTROL PANEL

A. Where shown on the plans, provide and install a Network Node Intelligent Addressable Multiplex Fire Alarm System.

B. The Fire Alarm Control Panel construction shall be modular with solid state, microprocessor based electronics. The FACP cabinet shall not be filled to over 80% capacity to allow for future expansion. All visual indicators shall be high contrast, LCD and LED as needed.

C. Provide for (5) Disable/Enable Zone Levels. Levels can be software or front panel switch controlled. Allows for devices in disabled zone to report to panel and DPS monitoring, but no other alarm output shall function, e.g. A/V's, door release, HVAC Shutdown etc. When engaged, shall initiate a trouble condition at the control panel. Provide for the following levels:

1. Disable/Enable Smoke Detection zones. Pulls, Heats & Flows can initiate an alarm.
2. Disable/Enable Smoke & Heat Detection zones. Pulls & Flows can initiate an alarm.
3. Disable/Enable Flow & Tamper zones. Smoke, Pulls & Heats can initiate an alarm.
4. Disable/Enable All initiating zones & output controls. Alarms displayed at panel only.

D. A manual evacuation switch shall be provided at the panel to operate the system indicating appliances and/or initiate "Drill" procedures. If a drill switch is not provided on the front of the FACP, a manual pull station shall be installed adjacent to panel. Exception, unless a manual pull station is within 15 feet of FACP.

E. The control panel shall include a built-in walk test mode to facilitate testing and system inspection. Dependent on system/manufacturer chosen, contractor shall fully explain functionality of walk test feature.

F. System amplifiers: Amplifiers shall be 25 Volts rms and supply a minimum of 30 Watts, utilize system battery back-up and supervision for amplifier failure. A back-up amplifier of equal power with auto switch over shall be used, or if specifically called for in spec.

G. The control panel shall contain the minimum following features as per plans:

1. Minimum Capacity of 1000 Control or Monitor Points
2. Addressable Initiation Device Circuits (SLC) (Style 4 or 6 capable)
3. Alarm Indicating Appliance Circuit
4. Alarm verification per point, and tally
5. Nonvolatile history files for Alarms, Troubles, and Supervisory events.
6. Supervised Annunciator Circuits
7. Local Energy City Connection, as required
8. Form C Alarm Contacts (2.0 Amps ea., 3 total)
9. Earth Ground Supervision Circuit
10. Automatic Battery Charger
11. Standby Batteries
12. Resident non-volatile programmable operating system memory for all operating requirements
13. Power supplies and batteries as required for auxiliary functions as indicated. Note: Bolt-on terminals shall be used on battery sets if their back-up power current exceeds nine (9) amps in AC off mode. Fast-on terminals to be used otherwise.
14. Front panel controls, or programmed software zones for disabling/enabling system functions to facilitate testing or normal building maintenance operations.
15. Auxiliary contacts or relays for auxiliary functions as indicated
16. All Custom Software and Programming as required to suit the project requirements.

2.5 REMOTE ANNUNCIATOR

A. Where indicated on the plans, provide, and install annunciator/control panel, and LCD annunciator display. The panel shall be of vandal-resistant construction and shall contain a liquid crystal

illuminated display for alphanumeric indication of all required functions. The panel shall also contain the following control functions, activated by a master system enable key switch on front panel:

1. Manual Control Switches shall be provided for the following functions:
2. System Reset
3. Alarm Silence
4. Trouble Silence
5. Manual Evacuation
6. Alarm Acknowledge (NFPA-72)
7. Trouble Acknowledge (NFPA-72)

B. Wiring between main control panel and annunciator(s) shall be fully supervised and accomplished over twisted shielded pair and/or THWN wiring as required by the manufacturer, per NEC.

C. Annunciator panel shall be recessed in wall with flush trim.

D. Install panel 54" AFF to centerline.

E. Annunciator window English language legends shall be custom, to display both zone number and brief legend indicating the area or device associated with that zone. The fire alarm system vendor shall coordinate the legends with the Engineer at shop drawing review.

F. Provide all programming and software necessary to place annunciators and controls in full operation. System set-up shall allow for expansion of annunciators without rewiring or addition of supervision modules.

2.6 REMOTE REPORTING TELEPHONE DIALER

A. Provide either an internal fire alarm panel or a remote digital alarm communicator/transmitter (DACT). Install at telephone terminal board or telephone service entrance and provide supervised wiring to fire alarm control panel as required. Provide wiring to telephone system, two dedicated lines as required for reporting to central station.

B. The installation and connection of the DACT shall be in compliance with all provisions of NFPA 71 and any and all other applicable codes. The installation and connection shall be acceptable to the Authority Having Jurisdiction, as well as the telephone company (or companies) over whose lines the signal(s) will be transmitted. Include any costs associated with telephone company work and services required in bid. Telephone connection shall be in compliance with NFPA 71, chapter five.

C. The DACT shall be capable of transmitting all information relative to system status changes due to alarm, trouble, water flow, and any other information as required by current codes applicable to the facility. This information shall be transmitted to a UL listed Central Receiving Station that also is maintained in accordance with the requirements of NFPA 71.

D. As a part of this contract, the services of a Central Receiving Station (as above) shall be engaged for a period of one year from the date of substantial completion, this date as defined elsewhere in these documents. The Contractor shall initiate this service, provided on a contract basis, and shall include any costs associated with this provision in his bid. The actual beginning date of the contract with the central receiving station may be adjusted at the discretion of the Engineer, but in no case shall be for less than one year. The contractor shall notify the owner in writing by certified mail that this service has been contracted for and explain the provisions of this service adequately. A copy of this communication and the return receipt shall be forwarded to the Architect and the Engineer. Coordinate preferred central station monitoring station and service with owner prior to ordering.

2.7 MULTIPLE IDNET PERIPHERAL NETWORK (IDNET)

A. Communication with addressable devices: The system must provide communication with all initiating and control devices individually. All of these devices are to be individually annunciated at the control panel. Annunciation shall include the following conditions for each point:

1. Alarm
2. Trouble
3. Open

4. Short
5. Ground
6. Device Fail/or Incorrect Device

B. All addressable devices are to have the capability of being disabled or enabled individually.

C. Up to 250 addressable devices may be multi-dropped from a single pair of wires. Systems that require factory reprogramming to add or delete devices are unacceptable.

D. Format:

1. The communication format must be a poll/response protocol to allow t-tapping of the wire to addressable devices and be completely digital. A high degree of communication reliability must be obtained by using parity data bit error checking routines for address codes and check sum routines for the data transmission protocol. Systems that do not utilize full digital transmission protocol (i.e., that may use time pulse width methods to transmit data etc.) will not be acceptable since they are considered unreliable and prone to errors.

E. Identification of Addressable Devices:

1. Each addressable device must be uniquely identified by an address code entered on each device at time of installation. The use of jumpers to set address will not be acceptable due to the potential of vibration and poor contact.

F. Wiring Type, Distances, Survivability and Configurations:

1. Wiring types will be approved by the equipment manufacturer. The system must allow up to 2,500 feet wire length to the furthest addressable device. Class “B” (Signaling Line Circuit as defined by NFPA-72A) communications will be provided where shown on the drawings. Wire will be so routed to maintain sufficient distance between the forward and return loop as called for by the Authority Having Jurisdiction (AHJ). To minimize wire routing and to facilitate future additions, t-tapping of the communications channel will be supported except where Class “B” wiring is required.

2.8 PERIPHERAL DEVICES

A. GENERAL: On fully digital multiplex systems, provide addressable devices, bases or modules for devices listed herein. Each device shall be an individual address on the system. Addressable bases or modules shall be UL listed for the device served.

B. MANUAL PULL STATION

1. Manual stations shall be non-coded, double action and shall be constructed of high impact, red Lexan or cast metal with raised white lettering and a smooth high gloss finish. The manual pull station shall have a hinged front with key lock. Stations shall be keyed alike with the fire alarm control panel. When the station is operated, the handle shall lock open in a protruding manner. Furnish one key for each manual station to owner at close of project, during instruction period.
2. Install manual pull stations within 60" of each exit, per code, whether indicated on the drawings or not and mounted no higher than 48 inches above the finished floor.
3. When the station is operated, the handle shall lock in a visually indicating manner. Furnish one key for each manual station to owner at close of project.
4. During installation, new and as not operable devices shall have paper covers that read “This device not in service” then removed when placed in service.
5. Provide pull stations with protective shields with audible alarms as noted on the drawings. Shield shall be “Stopper II” or equal. Stoppers shall not be required for non-public areas, e.g., mechanical rooms, penthouse locations etc.
6. Stations that utilize screwdrivers, Allen wrenches, or other commonly available tools shall not be used.
7. Keyed pull stations shall be institutional, vandal resistant type with key operator only. Provide with tamper-resistant torx head mounting hardware and install completely flush with finished walls.

C. CEILING-MOUNTED SMOKE DETECTORS, PHOTOELECTRIC TYPE

1. Furnish and install where indicated on the plans or required, ceiling-mounted smoke detectors. Provide separate outlet-box mounted base with auxiliary relay, or standard base, as required.
2. Normal operation: Detector is programmed for verification. Detection of smoke or heat by unit will cause general alarm.
3. Smoke Detectors shall be listed to U.L. Standard 268 and shall be compatible with their control equipment. Detectors shall be listed for this purpose by Underwriters' Laboratories, Inc. The detectors shall obtain their operating power from the fire alarm panel supervised SLC detection loop. Loss of the operating voltage shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal to be generated at the control panel. Detectors shall be capable of being reset at the main control panel.
4. No radioactive materials shall be used. Detector construction shall provide mounting base with twist-lock detector head. Contacts between the base and head shall be of the bifurcated type using spring-type, self-cleaning contacts. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control panel. The removal of a single detector head shall not cause an open on the SLC loop. Detector design shall provide full solid-state construction, and compatibility with other normally open fire alarm detection loop devices such as heat detectors, pull stations, etc.
5. To minimize nuisance alarms, voltage and RF transient problems, suppression techniques shall be employed as well as a smoke verification circuit and an insect screen. The detector head shall be easily disassembled to facilitate cleaning.
6. Where indicated or required, provide wire guards that are U.-listed for the device and that correctly covers the unit.
7. Remote LED alarm indicators shall be installed where required and for Duct Detection units.
8. Smoke detectors (and all other system electronics) shall be shielded to protect circuitry from EMI problems generated by power fields, cellular phones, etc.
9. Special Note: The Contractor installing smoke detectors shall use care in the final positioning of all devices. They shall not be installed closer than 36" from an air diffuser or return grille, closer than 24" from a ceiling/wall intersection, or similar location that would diminish detector performance. Refer to and comply with NFPA 72E, "Standard On Automatic Fire Detectors".
10. Provide smoke detector at each fire alarm system control component, as required by code.
11. The Contractor installing smoke detectors shall use care in the final positioning of all devices. They shall not be installed closer than 36" from an air diffuser or return grille, closer than 24" from a ceiling/wall intersection, or similar location that would diminish detector performance. Refer to NFPA 72E, "Standard On Automatic Fire Detectors".

D. AUTOMATIC HEAT DETECTORS

1. Automatic addressable heat detectors shall be combination rate-of-rise and fixed-temperature type. When the fixed-temperature portion is activated, the units shall be restorable. Heat detectors shall be 135, 165 or 195F, as indicated on plan. Where not indicated, provide 135F units. Where detector requires or is indicated to be furnished with a wire guard, utilize a U.L. listed unit, correctly covering and compatible with the device.

E. AUTOMATIC HEAT DETECTORS (FIXED TEMPERATURE TYPE)

1. Where indicated on the plans, provide automatic (conventional) heat detectors of the non-restorable type, of the temperature rating as indicated or required. Detector heads shall be mounted to an outlet-box mounted base. Provide addressable module for each detector as required. Wire Class “B”.

F. AUDIO/VISUAL UNITS:

1. Audible signals shall be delivered by speaker. Each audible assembly shall include separate wire leads for in/out wiring for each leg of the associated signal circuit. T-tapping of signal device conductors to signal circuit conductors will not be accepted. Each audible device

shall produce a minimum sound pressure level of 92db at 36” on axis. Locate as indicated or required. All audible tones for same function shall be identical, per NFPA. Provide sufficient audible units to comply with code for required coverage and voice intelligibility. Provide temporal coded signals. Audible units and visual units shall be wired to separate Notification circuits, allowing for silencing of audibles with alarm acknowledgment, continuing operation of strobes until system reset. Addressable devices may be used to fulfill this requirement.

2. The audio-visual units shall be equipped with a Xenon-type strobe which shall be semi-flush mounted on compatible 4" square outlet box. The speaker/strobes shall be listed under UL 1971 for signal devices for the hearing impaired. All building strobes shall be synchronized.
3. If an Audio/Visual unit is required to mounted in at exterior, swimming pool area, or shower room location, units shall be weatherproof, and mounted upon appropriate weather proof back box. One audio/visual device shall be located at each building fire department access location and/or fire department connection location as required per local/state mandate.
4. The output intensity of all visual units, their locations and mountings shall be in compliance with the latest version of the Americans with Disabilities Act requirements. Provide additional units as needed to meet these requirements.
5. Units shall be high-impact Lexan and shall have the word “FIRE” in contrasting lettering on the sides and/or face. Lettering shall be oriented upright to the standing viewer.
6. All visual signals shall develop an output of 15, 30, 75, 110 or higher candela as required to suit the size of coverage area.
7. Audible units and visual units shall be wired to separate Notification circuits, allowing for silencing of audible with alarm acknowledgment, continuing operation of strobes until system reset. Addressable devices may be used to fulfill this requirement.

G. VISUAL UNITS

1. Stand-alone visual indicating units shall be xenon type strobe matching audio-visual units with selectable candela rating settings. These devices shall be UL listed and be or wall mounted. A high-impact clear lens shall project out from backplate for fire notification. Units shall be high-impact Lexan and shall have the word “FIRE” in contrasting lettering on the sides and/or face. Lettering shall be oriented upright to the standing viewer. Candela output values of all visual units shall be selected for the covered spaces geometry and size, complying with ADA and NFPA.
2. Provide system-wide synchronization of all visual devices, so that all strobes flash at the same rate and at the same time, complying with ADA.
3. The output intensity of all visual units, their locations and mountings shall be in compliance with the latest version of the Americans with Disabilities Act requirements. Provide additional units as needed to meet these requirements.
4. All visual signals shall develop an output of 15, 30, 75, 110 or higher candela as required to suit the size of coverage area.

H. DUCT SMOKE DETECTORS

1. Duct smoke detectors shall be of the solid state photoelectric type, operating on the light scattering photodiode principle. The detectors shall ignore invisible airborne particles or smoke densities that are below the set alarm point. No radioactive materials shall be used. The basic construction of duct smoke detectors shall be the same as that previously described for ceiling-mounted smoke detectors. Duct housing couplings shall be slotted to insure proper alignment of the sampling and exhaust tubes. Detector shall have an alarm status LED visible through a transparent cover, panel or in housing.
2. The Contractor shall furnish air duct smoke detectors with template to the Mechanical Contractor for installation. Coordinate length of sampling probe required with the Mechanical Contractor and furnish appropriate length. Probe tube shall be located in accordance with manufacturer's recommendations, to give maximum sampling rate of airflow. Provide multiple detectors, as required, if a single device will not provide adequate sensing due to duct size or air velocity.

3. Wire multiple detectors on a single air handling system as a single zone or address unless otherwise required by prevailing codes. Field verify quantity of detectors needed to provide NFPA-compliant coverage of the air handling unit and provide as required.
4. Detector supervised power and alarm wiring (from Fire Alarm Control Panel) is to be provided by the Electrical Contractor. Interlock wiring from auxiliary contacts to stop air handling unit fan motor is to be provided by the Mechanical Contractor. Provide auxiliary contacts as required. Zone wiring and indication for air duct smoke detectors shall be maintained separate from area detection devices. Detector shall be capable of being reset at the main control panel, in addition to the reset station indicated below.
5. Where air duct smoke detectors are located in other than Mechanical Rooms or in spaces not easily visible, a remote alarm/power indicating LED key reset station shall be installed. These remotes shall be ganged together, if required, and labeled accurately as to which unit is reporting an alarm condition.
6. Where air duct smoke detectors are indicated to be furnished at concealed air handling units above ceilings or smoke damper locations, furnish as outlined above. Also provide remote indicating alarm LED flush in corridor wall at 7'-0" A.F.F. immediately below installation, or as close as practical to installation. The Mechanical Contractor is to provide control wiring, E.P. switches, etc., as required to operate smoke dampers, as well as the required operating circuit. Coordinate all requirements with the installer of smoke dampers.
7. At each duct smoke detector, a remote alarm/power indicating LED key reset station shall be installed. Locate these stations typically adjacent to an automatic temperature control panel as directed. These remotes shall be ganged together, if required, and labeled accurately as to which unit is reporting an alarm condition.
8. Ionization - type detectors shall not be utilized for air duct smoke detection.
9. All air duct smoke detector installations and materials shall be in accord with UL, NFPA, and any other applicable codes.
10. Written documentation shall be provided to prove proper air flows at and thru sampling tubes.
11. The Mechanical and Electrical Contractors shall coordinate location of these probes and housing in accordance with manufacturer's recommendations. Detectors not coordinated shall be relocated at the contractor’s expense.

I. WATER FLOW AND SPRINKLER SUPERVISORY SWITCHES

1. Where indicated on the plans, interconnect to water flow and supervisory switches with addressable modules. Flow switches shall give the flow alarm description by area involved e.g. Water Flow “FLR1 W. Wing Areas”. Supervisory switches shall be monitored by one module per switch, and programmed to indicate their physical location, and area they control as described earlier.

J. DOOR HOLD OPEN DEVICES

1. Install new door holders where shown on prints. Magnetic door holders shall be 24 volt D.C., and shall have an approximate holding force of 35 lbs. The door portion shall have a plated steel pivot mounted armature with shock absorbing nylon bearing. Unit shall be flush mounted. Door holders shall be UL listed for their intended purpose. Where door mounted, locate armature 6" down from top and 6" in from strike side of leaf. Where door swing prevents direct contact between armature and holder pole piece, provide plated chain to close gap as tightly as possible. Verify holder positioning with architect prior to mounting any devices.
2. Door holders shall be FM 998 approved.
3. Install a smoke detector on each side of any door equipped with a hold open device.

K. END OF LINE RESISTOR

1. End-of-line devices (if required) shall be flush-mounted, located at 7'-0" A.F.F. in corridor walls or as indicated.

L. REMOTE POWER SUPPLY UNITS FOR PERIPHERAL

1. Provide remote power supply(ies) as required for proper system operation.
2. Remote power supplies shall be provided with local intelligence compatible with the digital multiplex network, so they have a unique address, providing the ability to monitor the supply for loss of power, shorts, grounds, and other supervisory functions.
3. Where required by the fire alarm system manufacturer, remote power supplies shall be provided that will provide sufficient current to drive audio/visual or other required devices.
4. These units shall be located in electrical closets, mechanical rooms, or similar spaces. They shall not be installed in finished areas, storage rooms, etc., without the permission of the Engineer. All locations shall be indicated on the shop drawing submissions.
5. Provide dedicated 120-volt power circuit(s) from nearby panelboards as required, whether indicated on the plans or not.

M. ISOLATED LOOP CIRCUIT PROTECTOR (LCP)

1. Furnish and install an isolated loop circuit protector device on all fire alarm initiating device circuit, alarm indicating appliance circuit, signaling line circuit wiring (including shields), which extends beyond the main building by either aerial, underground or other methods [walkways, bridges, or other above ground connectors.
2. The ILCP is to be located as close as practicable to the point at which the circuits leave or enter a building.
3. The ILCP grounding conductor is to be a No. 12 AWG wire having a maximum length of 28 feet to be run in as straight a line as practicable and connected to a building ground electrode system (unified ground) per Article 800-31 of the (1987) National Electrical Code.
4. The ILCP furnished is to have a line to line response time of less than one (1) nanosecond capable of accepting greater than 2000 amps (35 joules each line) to earth. Shield to earth current is to be 5000 amps maximum. The ILCP is to be protected by a high dielectric insulating material and of small enough size to mount in a standard 4@ square 2-1/8@ deep electrical box. Spark gap devices or devices incorporated in or installed within the fire alarm control panel in lieu of the specified ILCP are not acceptable.
5. All Isolated Loop Circuit Protectors must comply with UL #497B requirements.
6. In addition to the UL-UOJZ requirement mentioned above, the system controls shall be UL listed for Power Limited Applications per NEC 760. All circuits must be marked in accordance with NEC article 760-23.

N. AUTOMATIC CARBON MONOXIDE DETECTOR

1. Automatic Carbon Dioxide Detectors: Provide manufacturer’s standard construction Carbon Monoxide detector. Control panel shall be programmed to provide supervisory trouble alert at carbon monoxide level determined by the owner and engineer. Control panel shall be programmed to go into alarm at higher carbon monoxide level determined by the owner and engineer.
2. Where carbon monoxide alarms are indicated, provide with sounder base for local audible notification.
3. All carbon monoxide detection/alarm devices and components shall be UL 2034 or UL 2075 listed, as applicable.

O. WEATHERPROOF DEVICES

1. Where the anticipated atmosphere or installation conditions require weather-proof or other specially housed devices, they shall be U.L.-listed and NFPA-compliant and provided as indicated or required. Verify installation conditions and indicate type of device on shop drawing submission. Provide weather-proof device and backbox.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Provide and install the system in accordance with the plans and specifications, all applicable codes, and the manufacturer's recommendations. All wiring shall be in a completely separate conduit system from power wiring or other raceway systems. Minimum conduit size shall be 3/4" trade size. Maximum wire fill shall be 40%, for any raceway system.

C. All junction boxes and cover plates shall be painted red and labeled "Fire Alarm". A consistent wiring color code shall be maintained throughout the installation. The number of wiring splices shall be minimized throughout. Excessive wire splicing (as determined by the Engineer), shall be cause for rejection of the work.

D. All conductive cabling associated with this system that extends beyond the building envelope shall be provided with surge suppression. Suppression installed shall be approved by the fire alarm equipment manufacturer and in accordance with Division 26 specifications.

E. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate tradesmen or other contractors.

F. The Contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of installation.

G. The manufacturer's authorized representative shall provide on-site supervision of installation and shall perform the initial "power-up" of the system after he has thoroughly checked the installation.

H. Operation and maintenance manuals submitted for this project shall list names, license numbers, and telephone numbers of at least two installers that are employed full time by the supplier/manufacturer to install and test fire alarm systems in the installation location.

I. A floor plan drawing indicating fire alarm devices, their addresses, wiring and wiring only, shall be provided by the manufacturing company for job site use. These drawings shall be approved by the State Fire Marshal's Office or Local Authority Having Jurisdiction, as appropriate and in accord with code requirements. A copy of this drawing shall be submitted to the Engineer for his review and project records.

J. All submittals for this project shall list names, license numbers, and telephone numbers of two installers that are employed full time by the manufacturer to install and test fire alarm systems in the installation location.

K. Wall mounted audio/visual devices shall be mounted 80" above the floor or 6" below the ceiling, whichever is lower.

L. Coordinate connections to access controlled doors with door hardware specifications and actual door hardware. Provide all connections for release of locking mechanisms in egress paths as required.

M. Verify exact connection requirements to all equipment and devices of other trades with those trades prior to ordering equipment.

N. All connections to fire alarm devices shall be made by a technician both certified by the state/local jurisdiction and NICET Level II. No exceptions. Electrical contractor can install raceways and pull cables only. Demolition also can only be made by NICET Level II and state/local jurisdiction certified fire alarm technicians.

O. Provide wire guards for all devices in areas where prone to physical damage such as gyms. Wire guards shall allow for proper clearance around devices.

P. All surface boxes shall be as manufactured by the device manufacturer for the installed device and shall match devices in size.

Q. Install wall-mounted equipment, with tops of cabinets not more than 72 inches above the finished floor.

R. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A [or Appendix B] in NFPA 72.
5. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.

S. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

T. Provide heat detectors at elevator room, shaft, and pit to open elevator power circuits as detailed.

U. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

V. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

3.2 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Smoke dampers in air ducts of designated air-conditioning duct systems.
2. Alarm-initiating connection to elevator recall system and components.
3. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
4. Supervisory connections at valve supervisory switches.
5. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
6. Supervisory connections at elevator shunt trip breaker.

3.3 POWER REQUIREMENTS

A. The control panel shall receive 120 VAC power via a dedicated circuit. The incoming circuit shall have suitable overcurrent protection within the control panel, as well as at the circuit source.

B. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of time as required by codes for the building occupancy. There shall be reserve battery capacity to drive all alarm appliances for five-minute indication at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operating shall be automatic. Batteries, once discharged, shall recharge at a rate that will provide a minimum of 70% capacity in 12 hours, or sooner if required by codes.

C. All circuits requiring system operating power shall be 24 VDC and shall be individually fused at the control panel.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.5 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.6 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by Authorities Having Jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Tests and Inspections:

1. The completed fire alarm system shall be fully tested in accordance with NFPA-72H and NFPA-92B by the contractor in the presence of the Owner's representative and the Local Fire Marshal. Upon completion of a successful test, the Contractor shall certify the test results in writing to the Fire Marshal, Owner, General Contractor, Architect and Engineer. Provide one week's written advance notice of the test to all concerned parties.
2. All auxiliary devices the fire alarm system is connected to, including tamper switches, flow switches, elevator controls, remote receiving stations, etc., shall be fully tested for proper operation where interfacing with the fire alarm system.
3. Demonstrations and Training: Training of the owner’s operation and maintenance personnel is required in cooperation with the Commissioning Authority. The instruction shall be scheduled in coordination with the Commissioning Authority after submission and approval of formal training plans.
4. The Contractor shall provide a minimum of eight hours of instructional time to the Owner in the operation and maintenance of all equipment and components. A receipt shall be obtained from the Owner that this has been accomplished, and a copy forwarded to the Engineer. Provide additional training time if required by the Owner at no charge to the contract or as direct charge to the Owner.
5. Contractor and manufacturer shall be required to accompany the engineer on a complete system verification after the installation has been certified. This shall include physically testing each device and reviewing descriptive device readout.
6. Visual Inspection: Conduct visual inspection prior to testing.
    a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
    b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
7. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
8. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.7 DEMONSTRATION

A. Provide minimum of eight (8) hours of training to Owner’s maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283100

SECTION 310000 - EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. A report of geotechnical services was completed and prepared for the site of this Work and is included in the specifications.

1.2 SUMMARY

A. Section Includes:

This Section includes all work; labor, machinery, disposal and replacement of unsuitable soil, removal of rock and any materials encountered to plan bottom depth/ subgrade for all earthwork related items. These items shall include, but are not limited to, earthwork procedures for drives, parking lots, pavements, building foundations, footings, caissons, building slabs, utility trenches, etc.

All excavation, fill work shall be considered as unclassified with regard to type and condition with costs reflecting all expenses necessary to achieve plan bottom depth/ subgrade and all grading effort as shown on the drawings.

No change in the contract price will be considered for any materials encountered and/or required to be removed, or replaced to achieve plan bottom depth/ subgrade the earthwork requirements.

The following is a list of the items, which are included as a part of this work:

1. Preparing subgrades for slabs-on-grade, walks, pavements, turf, grasses and planting.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Subbase course and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices for earth moving specified in Division 1 Section "Unit Prices."

B. Quantity allowances for earth moving are included in Division 1 Section "Allowances."

C. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.

1. 24 inches (600 mm) outside of concrete forms other than at footings.
2. 12 inches (300 mm) outside of concrete forms at footings.
3. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
5. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
6. 6 inches (150 mm) beneath pipe in trenches, and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

1.4 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet (3 m)in width and more than 30 feet (9 m) in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp (103-kW) flywheel power with bucket-curling force of not less than 28,700 lbf (128 kN) and stick-crowd force of not less than 18,400 lbf (82 kN) with extra-long reach boom; measured according to SAE J-1179.

2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp (172-kW) flywheel power and developing a minimum of 47,992-lbf (213.3-kN) breakout force with a general-purpose bare bucket; measured according to SAE J-732.

I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. (0.57 cu. m)or more in volume that exceed a standard penetration resistance of [100 blows/2 inches (97 blows/50 mm)] when tested by a geotechnical testing agency, according to ASTM D 1586.

J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

K. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, structures, drainage fill, drainage course, or topsoil materials.

M. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

N. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones 1 inch (25 mm) or larger in any dimension, and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on the site and /or amend existing surface soil to produce topsoil as defined above with minimum 4 percent organic matter. Supplement with imported topsoil when quantities are insufficient to achieve the grading effort as shown on the drawings. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

O. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 SUBMITTALS

A. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextile: 12 by 12 inches (300 by 300 mm).
2. Warning Tape: 12 inches (300 mm) long; of each color.

B. Qualification Data: For qualified testing agency.

C. Material Test Reports: For each on-site and] borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698 or ASTM D 1557 as required by Geotechnical Report.

3. All reports are to be signed by a Professional Engineer with licences to practice in the state of this project

D. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

B. Preexcavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

C. Codes and Standards: Perform excavation work in compliance with aplicable requirements of authorities having jurisdiction. Prepared aggregate subbase shall comply with the Kentucky Transportation Cabinet (KTC) standard specifications, latest edition and with the local governing regulations, if more stringent than herein specified.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify “Call 811 Before You Dig" for area where Project is located before beginning earth moving operations.

D. Do not commence earth-moving operations until temporary erosion- and sedimentation-control measures, specified in Division 2 Section 02010 “ Erosion and Sediment Control “ and shown on Erosion Sediment Contrail Plan are in place.

E. Do not commence earth-moving operations until plant-protection measures specified in Division 2 Section "Tree Protection and Trimming" are in place.

F. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

4. Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.
5. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to the utility owner's satisfaction at no cost to the Owner.

G. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

H. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other is digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

I. Do not direct vehicle or equipment exhaust towards protection zones.

J. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487 or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. CL and CH with a dry density above 100, a Liquid Limit less than 50 and a Plastic Index under 30 will also be considered satisfactory

2. CL and CH may be used as recommended by Geotechnical Investigation and report.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction or as noted in the Geotechnical report..

2. CL and CH with a dry density below 100, a Liquid Limit greater than 50 and a Plastic Index greater than 30 will be considered for use only by recommendation by the Geotechnical Engineer. Additional requirements for use of these types of soil may be required

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.

J. Sand: ASTM C 33; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
3. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
4. Tear Strength: 56 lbf (250 N); ASTM D 4533.
5. Puncture Strength: 56 lbf (250 N); ASTM D 4833.
6. Apparent Opening Size: No. 40 (0.425-mm) sieve, maximum; ASTM D 4751.
7. Permittivity: 50 gpm per sqft per, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 247 lbf (1100 N); ASTM D 4632.
3. Sewn Seam Strength: 222 lbf (990 N); ASTM D 4632.
4. Tear Strength: 90 lbf (400 N); ASTM D 4533.
5. Puncture Strength: 90 lbf (400 N); ASTM D 4833.
6. Apparent Opening Size: No. 30 (0.6-mm) sieve, maximum; ASTM D 4751.

7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, flowable concrete material produced from the following:

1. Portland Cement: ASTM C 150, Type I.
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33, 3/8-inch (10-mm)] nominal maximum aggregate size.
4. Foaming Agent: ASTM C 869.
5. Water: ASTM C 94/C 94M.
6. Air-Entraining Admixture: ASTM C 260.

B. Produce low-density, controlled low-strength material with the following physical properties:

1. As-Cast Unit Weight: 30 to 36 lb/cu. ft. (480 to 576 kg/cu. m)) at point of placement, when tested according to ASTM C 138/C 138M.
2. Compressive Strength: 80 psi (550 kPa) 10 psi (965 kPa), when tested according to ASTM C 495.

2.4 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

D. Protect subgrades and foundation soils from freezing temperatures and frost. Provide protective insulating materials as necessary.

E. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES (BLASTING IS NOT ALLOWED ON THIS PROJECT)

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

a. 24 inches (600 mm) outside of concrete forms other than at footings.
b. 12 inches (300 mm) outside of concrete forms at footings.
c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.

d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
e. 6 inches (150 mm beneath bottom of concrete slabs-on-grade.
f. 6 inches (150 mm) beneath pipe in trenches, and the greater of [24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches (150 to 300 mm) above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Division 2 Section "Tree Protection and Trimming."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches (300 mm) each side of pipe or conduit

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels

of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Division 2 Section "Tree Protection and Trimming."

3.8 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 25 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
3. Do not proof roll wet or saturated subgrades.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section "Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase course. Concrete is specified in Division 3 Section "Cast-in-Place Concrete.

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Place and compact initial backfill of subbase material free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

G. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches (300 mm) over the pipe or conduit.

H. Coordinate backfilling with utilities testing.

I. Place and compact final backfill of satisfactory soil to final subgrade elevation.

J. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

K. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Refer to Shot-Rock and Clay Fill Recommendations in Geotechnical Investigation

C. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

D. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698 and following recommendations of the Geotechnical Report.

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 98 percent. The moisture content shall be maintained between minus 3, plus 1 percent of the optimal moisture
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 95 percent. The moisture content shall be maintained between minus 3, plus 1 percent of the optimal moisture
3. Under turf or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85 percent.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.17 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Division 2 Section "Subdrainage."

B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch (150-mm) course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches (300 mm) of filter material, placed in compacted layers 6 inches (150 mm) thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).

1. Compact each filter material layer to 95 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches (300 mm) of final subgrade, in compacted layers 6 inches (150 mm) thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.
2. Place and compact impervious fill over drainage backfill in 6-inch- (150-mm-) thick compacted layers to final subgrade.

3.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Install separation fabric on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

B. Under pavements and walks, place subbase course on separation fabric according to fabric manufacturer's written instructions and where indicated on the drawings..

C. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

D. On prepared subgrade, place subbase course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase course to required crown elevations and cross-slope grades.
4. Place subbase course 6 inches (150 mm) or less in compacted thickness in a single layer.
5. Place subbase course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
6. Compact subbase courseat optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

E. Pavement Shoulders: Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.19 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Under slabs-on-grade, install drainage fabric on prepared subgrade according to manufacturer's written instructions where indicated on the drawings, overlapping sides and ends. Place drainage course on drainage fabric and as follows

B. Place drainage course on subgrades free of mud, frost, snow, or ice.

C. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 98 percent of maximum dry unit weight according to ASTM D 698.

3.20 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of controlled fill.
5. Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design-bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m)or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet (30 m) or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) or less of trench length, but no fewer than two tests.
4. All column footings interior and along exterior wall shall be individually tested for acceptance for bearing capacity using the dynamic cone penatration.
5. The foundation wall footings shall be tested using the dynamic cone penatration test at an interval of not less than 30’.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.21 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Contractor shall remove all stone and filter fabric placed for construction access and scarify all sub-grades to a depth of 4” prior to placement of topsoil. Contractor shall place a minimum of 6” of topsoil on all areas outside of the buildings that are not paved or constructed with other improvements. Topsoil shall be free of stones and amended as necessary to meet definitions of topsoil prior to placement on site

END OF SECTION 310001

SECTION 312200 - GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading the site for site structures, building pads, and paved areas (roads and parking).

C. Finish grading.

1.02 RELATED REQUIREMENTS

A. Section 311000 - Site Clearing.

B. Section 310000 - Earthwork

C. Section 312323 - Fill: Filling and compaction.

D. Section 312316.13 - Trenching: Trenching and backfilling for utilities.

F. Section 329219 - Seeding: Finish ground cover.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for general requirements relating to unit prices for this work.

1.04 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with State of Kentucky, Highway Department standards.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: See Section 312323.

B. Topsoil: See section 310000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey benchmark and intended elevations for the Work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect from damage above- and below-grade utilities to remain.

D. Notify utility company to remove and relocate utilities.

E. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

F. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.

G. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.04 SOIL REMOVAL

A. Stockpile topsoil to be re-used on site; remove remainder from site.

B. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.05 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. Where topsoil is to be placed, scarify surface to depth of 3 inches.

D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

E. Place topsoil in areas where seeding are indicated.

F. Place topsoil to the following compacted thicknesses:

G. Place topsoil during dry weather.

H. Remove roots, weeds, rocks, and foreign material while spreading.

I. Near plants spread topsoil manually to prevent damage.

J. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

K. Lightly compact placed topsoil.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

B. Top Surface of Finish Grade: Plus, or minus 1/2 inch.

3.07 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Architect as to remedy.

C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.08 FIELD QUALITY CONTROL

A. See Section 312323 for compaction density testing.

3.09 CLEANING

A. Remove unused stockpiled topsoil. Grade stockpile area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 312316.13 - TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Document Report of Geotechnical Exploration.

B. Section 312200 - Grading: Site grading.

C. Section 310000 - Earthwork.

D. Section 312323 - Fill: Backfilling at building and foundations.

E. Section 334600 - Subdrainage: Filter aggregate and filter fabric for foundation drainage systems.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for general requirements applicable to unit prices for earthwork.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.05 REFERENCES

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2001 (2004).

B. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

C. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2007.

D. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

E. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2007.

F. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

G. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2006.

H. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

I. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

J. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2005.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Compaction Density Test Reports.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where designated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill: Conforming to State of Kentucky Highway Department standard.

B. Structural Fill: Conforming to State of Kentucky Highway Department standard.

C. Concrete for Fill: As specified in Section 033000; compressive strength of 2500 psi.

D. Granular Fill: Coarse aggregate, conforming to State of Kentucky Highway Department standard.

E. Topsoil: See Section 312200.

2.02 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, woven.

2.03 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 312200 for additional requirements.

C. Locate, identify, and protect utilities that remain and protect from damage.

D. Notify utility company to remove and relocate utilities.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Protect plants, lawns, rock outcroppings, and other features to remain.

3.03 TRENCHING

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

G. Remove excavated material that is unsuitable for re-use from site.

H. Stockpile excavated material to be re-used in area designated on site in accordance with Section 312200.

I. Remove excess excavated material from site.

3.04 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.05 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

H. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

I. Correct areas that are over-excavated.
   1. Thrust bearing surfaces: Fill with concrete.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.

K. Reshape and re-compact fills subjected to vehicular traffic.

3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Utility Piping, Conduits, and Duct Bank:
   1. Bedding: Use granular fill.
   2. Cover with general fill.
   3. Fill up to subgrade elevation.
   4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

C. At Pipe Culverts:
   1. Bedding: Use granular fill.
   2. Place filter fabric specified in Section 330513 over compacted bedding.
   3. Cover with granular fill, see trench details.
   4. Fill up to subgrade elevation.
   5. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

D. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:
   1. Drainage fill and geotextile fabric: Section 334600.
   2. Cover drainage fill with general fill.
   3. Fill up to subgrade elevation.
   4. Compact to 95 percent of maximum dry density.

E. At French Drains:
   1. Use granular fill.
   2. Fill up to 8 inches below finish grade.
   3. Compact to 95 percent of maximum dry density.

3.07 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.08 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor"), ASTM D 1557 ("modified Proctor"), or AASHTO T 180.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests: at each compated initial and final backfill layer, at least one test for each 150 linear feet or less of trench length, but no fewer than two tests.

3.09 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 312316.26 - ROCK REMOVAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of identified and discovered rock during excavation.

1.02 RELATED REQUIREMENTS

A. Section 312323 - Fill: Fill materials.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for additional unit price requirements.

B. No change in the contract price shall be considered for ANY materials encountered and/or required to be removed, or replaced to achieve the earthwork requirements.

1.04 DEFINITIONS

A. Site Rock: Solid mineral material with a volume in excess of 1/3 cubic yard or solid material that cannot be removed with a 3/4 cubic yard capacity power shovel without drilling.

B. Trench Rock: Solid mineral material with a volume in excess of 1/6 cubic yard or solid material that cannot be removed with a 3/4 capacity power shovel without drilling.

C. Rock: Solid mineral material of a size that cannot be removed with a 1 cubic yard capacity power shovel.

1.05 REFERENCE STANDARDS

A. NFPA 495 - Explosive Materials Code; National Fire Protection Association; 2006.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.07 QUALITY ASSURANCE

A. Seismic Survey Firm: Company specializing in seismic surveys with five years documented experience.

B. Explosives Firm: Company specializing in explosives for disintegration of rock, with five years documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

A. Explosives: Type recommended by explosive firm following seismic survey and required by authorities having jurisdiction.

B. Delay Device: Type recommended by explosives firm.

C. Blast Mat Materials: Type recommended by explosives firm.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify site conditions and note subsurface irregularities affecting work of this section.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

3.03 USE OF EXPLOSIVES

A. Use of Explosives on this project shall not be allowed.

3.04 ROCK REMOVAL

A. Excavate and remove rock by mechanical methods only; use of explosives is prohibited.

B. Mechanical Methods: Drill holes and utilize expansive tools to fracture rock.

C. Form level bearing at bottom of excavations.

D. Remove shaled layers to provide sound and unshattered base for footings.

E. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

F. Remove excavated materials from site.

G. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 312323.

3.05 FIELD QUALITY CONTROL

A. Independent agency field inspection will be provided under provisions of Section 014000 - Quality Requirements.

B. Provide for visual inspection of foundation bearing surfaces and cavities formed by removed rock.

END OF SECTION

SECTION 312316 - EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, slabs-on-grade, paving, site structures, and utilities within the building.

B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Document Report of Geotechnical Investigation.

B. Section 312200 - Grading: Soil removal from surface of site.

C. Section 312200 - Grading: Grading.

D. Section 312323 - Fill: Fill materials, filling, and compacting.

E. Section 312316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

F. Section 312316.26 - Rock Removal: Removal of rock during excavating.

G. Section 334600 - Subdrainage: Filter aggregate and filter fabric for foundation drainage systems.

H. Section 315001: Excavating Support and Protection.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for general requirements applicable to unit prices for excavation.

1.04 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

PART 3 EXECUTION

2.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 312200 for additional requirements.

C. Locate, identify, and protect utilities that remain and protect from damage.

D. Notify utility company to remove and relocate utilities.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Protect plants, lawns, rock outcroppings, and other features to remain.

2.02 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

D. Do not interfere with 45 degree bearing splay of foundations.

E. Cut utility trenches wide enough to allow inspection of installed utilities.

F. Hand trim excavations. Remove loose matter.

G. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume. See Section 312316.26 for removal of larger material.

H. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 312323.

I. Grade top perimeter of excavation to prevent surface water from draining into excavation.

J. Remove excavated material that is unsuitable for re-use from site.

K. Remove excess excavated material from site.

2.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

2.04 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 312319 - DEWATERING (DURING CONSTRUCTION)

PART 1 -GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the design and installation of a temporary de-watering system until completion of construction to remove surface and subsurface waters from structure or utility trench excavations and pavement and sidewalk excavations as required.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 2 Section 310001: Earthwork

C. The Site Sub-Contractor shall be responsible for providing dewatering as associated with sitework and as required for the progress of the work.

D. The Sub-Contractor installing work in trenches shall be responsible for providing dewatering as associated with utility work in trenches as required for the progress of the work.

E. The Earthwork contractor shall be responsible for providing dewatering as associated with earthwork in pavement and sidewalk excavations as required for the progress of the work, unless indicated otherwise. If the contractor allows soils to become saturated and therefore deemed unsuitable by the on site testing agent, any required remediation shall be the responsibility of the contractor, including any undercut/over-excavation required to achieve suitable bearing conditions. This shall be at no additional cost to the Owner.

F. The Concrete foundation sub-contractor shall be responsible to provide dewatering as associated with footing excavations as required for the progress of the work.

1.3 SUBMITTALS

A. General: Submit to the Owner’s Representative for review, the proposed methods of construction, including de-watering, excavation, bedding, filling, compaction and back filling for the various portions of the Work. The Owner’s Representative's review shall be for method only. The Contractor shall remain responsible for the adequacy and safety of the methods.

B. Submittals shall include the following:

1. Design notes and drawings.
2. Descriptive literature of the temporary de-watering system.
3. Layout of all piping involved.

C. Binders: All submittal data shall be bound in three-ring binders and all sections shall be tabbed and properly indexed.

1.4 QUALITY ASSURANCE

A. Standards: The de-watering of any utility structure, utility trench or any other excavation and the disposal of water during construction shall be in accordance with all local and state government rules, regulations, and applicable permit conditions.

1.5 CRITERIA

A. The de-watering system shall be developed to the point that it is capable of de-watering the site surrounding all structures, pavement areas, utility structures, or utility trenches as shown on the Drawings. Each system shall be capable of de-watering and maintaining ground water levels to a minimum depth of 2 feet below the respective excavation.

1.6 PERMITS

A. General: Each Subcontractor shall be responsible for the preparation of, submission of, costs for, and any additional requirements necessary to obtain all permits required for de-watering.

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment: The equipment specified herein shall be standard de-watering equipment of proven ability as designed, manufactured, and installed by firms having experience in the design and production of such equipment. The equipment furnished shall be designed, constructed and installed in accordance with standard industry practices and methods.

PART 3 -EXECUTION

3.1 INSTALLATION

A. De-watering: The sub-contractors shall install a temporary de-watering systems for the removal of surface and subsurface water encountered during construction of the proposed structures, pavements or excavation of utility trenches.

3.2 PUMPING AND DRAINAGE

A. Maintenance: The sub-contractors shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering the proposed excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed sub-grade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. If the contractor allows soils to become saturated and therefore deemed unsuitable by the on site testing agent, any required remediation shall be the responsibility of the contractor, including any undercut/over-excavation required to achieve suitable bearing conditions. This shall be at no additional cost to the Owner.

B. Bearing: De-watering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the sub-grade soils at the proposed bottom of the excavation and to preserve the integrity of adjacent structures. At a minimum, the water level shall be two feet below the trench or excavation bottom. Well or pump installations

shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.

C. Rim Ditches: Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.

D. Flotation: the sub-contractors shall prevent Flotation, by maintaining a positive and continuous operation of the de-watering system. The Contractor shall be fully responsible and liable for all damages, which may result from failure of this system.

E. Fuel Spills: The sub-contractors shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.

3.3 PROTECTION AND SITE CLEAN-UP

A. Immediately upon completion of the de-watering operations, the sub-contractor shall remove all of his equipment, materials, and supplies from the site of the work, remove all surplus material and debris, fill in all holes or excavations, and grade the site to elevations of the surface levels which existed before work started.

END OF SECTION 312319

SECTION 312323 - FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade and paving.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Document Report of Geotechnical Exploration.

B. Section 312200 - Grading: Site grading.

C. Section 312316 - Excavation: Removal and handling of soil to be re-used.

D. Section 312316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

E. Section 312316.26 - Rock Removal: Removal of rock during excavating.

F. Section 334600 - Subdrainage: Filter aggregate and filter fabric for foundation drainage systems.

G. Section 321423 - Asphalt Unit Paving: Leveling bed placement under pavers.

H. Section 033000 - Cast-in-Place Concrete.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for general requirements applicable to unit prices for earthwork.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings and details.

1.05 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2001 (2004).

B. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

C. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2007.

D. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

E. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2007.

F. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

G. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2006.

H. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by

Nuclear Methods (Shallow Depth); 2005.

I. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

J. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2005.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

C. Compaction Density Test Reports.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill: Subsoil excavated on-site.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   3. Conforming to ASTM D 2487 Group Symbol CL.

B. Structural Fill: Subsoil excavated on-site.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   3. Conforming to ASTM D 2487 Group Symbol CL.

C. Concrete for Fill: Lean concrete.

D. Granular Fill: Coarse aggregate, conforming to State of Kentucky Highway Department standard.

E. Sand: Conforming to State of Kentucky Highway Department standard.

F. Topsoil:

- ❑ Topsoil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process and stockpiled on-site. Verify with local extension agent, suitability of native surface topsoil to produce viable planting soil. Modify and amend topsoil as required to achieve viable planting soil. Clean soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
- ❑ Supplement with off-site topsoil when on-site quantities are insufficient.
- ❑ Topsoil: ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of 2 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth. Use a Harley Rake/Rock Hound or similar to screen and clean the topsoil to meet requirements described herein.

2.02 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, woven.

B. Vapor Retarder: 10 mil thick, polyethylene.

2.03 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

B. Identify required lines, levels, contours, and datum locations.

C. See Section 312200 for additional requirements.

D. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

E. Verify structural ability of unsupported walls to support imposed loads by the fill.

3.02 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with granual material as recommended by onsite geotechnical engineer.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. All Fill operations shall comply with the Geotechnical Engineers Recommendations.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

H. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

I. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 100 percent of maximum dry density.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.
   2. At other locations: 95 percent of maximum dry density.

K. Reshape and re-compact fills subjected to vehicular traffic.

3.04 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Structural Fill:
   1. Use structural fill.
   2. Fill up to subgrade elevations.
   3. Maximum depth per lift: 6 inches, compacted.
   4. Compact to minimum 97 percent of maximum dry density.

C. Under Interior Slabs-On-Grade:
   1. Use granular fill.
   2. Compact to 95 percent of maximum dry density.
   3. Cover with Fill Type granular.
      a. Depth: 2 inches.
      b. Compact to 95 percent of maximum dry density.

D. At Foundation Walls and Footings:
   1. Do not backfill against unsupported foundation walls.

E. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:
   1. Drainage fill and geotextile fabric: Section 334600.
   2. Cover drainage fill with Fill Type granular fill.
   3. Fill up to subgrade elevation.
   4. Compact to 95 percent of maximum dry density.

F. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches:
   1. Bedding: Use granular fill.
   2. Cover with general fill.
   3. Fill up to subgrade elevation.
   4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

G. At Interior Crawl Spaces:
   1. Use general fill.
   2. Depth: 6 inches.
   3. Compact to 95 percent of maximum dry density.
   4. Install vapor retarder over entire exposed surface.
   5. Cover with granular fill, 2 inches deep.

H. Inside Planter Boxes:
   1. Use granular fill, 4 inches deep.
   2. Cover with geotextile fabric.
   3. Cover with sand, 2 inches deep.
   4. Finish with topsoil, to within 2 inches of planter rim, lightly tamped.

I. At Lawn Areas:
   1. Use general fill.
   2. Fill up to 6 inches below finish grade elevations.
   3. Fill up to subgrade elevations.
   4. Compact to 95 percent of maximum dry density.
   5. See Section 312200 for topsoil placement.

J. At French Drains:
   1. Use granular fill.
   2. Fill up to 8 inches below finish grade.
   3. Compact to 95 percent of maximum dry density.

K. Under Monolithic Paving and Monolithic Paver Setting Beds:
   1. Compact subsoil to 95 percent of its maximum dry density before placing fill.

2. Use general fill.
3. Fill up to 6 inches below finish paving elevation.
4. Fill up to subgrade elevation.
5. Compact to 95 percent of maximum dry density.
6. See Section 321123 for aggregate base course placed over fill.

L. Pervious Pavment:
1. Use granular fill.
2. Fill _24___ inches deep.
3. Fill up to _6___ inches below finish grade.
4. Fill up to subgrade elevation.
5. Maximum compacted depth of each lift: 6 inches.
6. Place geotextile fabric between soil and granular fill.
7. Compact to 95 percent of maximum dry density.

3.05 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.06 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor"), ASTM D 1557 ("modified Proctor"), or AASHTO T 180.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests: Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D698, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m)or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet (30 m) or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) or less of trench length, but no fewer than two tests.
4. All column footings interior and along exterior wall shall be individually tested for acceptance for bearing capacity using the dynamic cone penatration.
5. The foundation wall footings shall be tested using the dynamic cone penetration test at an interval of not less than 30'.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; re-compact and retest until specified compaction is obtained.

G.

H. Proof roll compacted fill at surfaces that will be under slabs-on-grade, pavers, paving, and as recommended by Testing Agency.

3.07 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 312500- EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

F. In general, the section includes all of the sediment and erosion control items needed to satisfy the regulatory authorities and may include, but not be limited to the following:

G. The Contractor Shall:
   1. Sign and obtain the Notice of Intent.
   2. Prepare and maintain a Best Management Practice Plan (BMP).
   3. Termination of the Notice of Intent.

1.02 RELATED SECTIONS

A. Section "Earthwork" for installation of the erosion and sediment control items.

1.03 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Documents: Documents affecting work of this section include but are not necessary limited to Kentucky Storm Water General Permit, Kentucky Erosion Prevention and Sediment Control Field Guide.

1.04 RELATED REQUIREMENTS

A. RELATED REQUIREMENTS
   1. Section 311000 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.
   2. Section 312200 - Grading: Temporary and permanent grade changes for erosion control.
   3. Section 313700 - Riprap: Temporary and permanent stabilization using riprap.
   4. Section 321123 - Aggregate Base Courses: Temporary and permanent roadways.
   5. Section 329219 - Seeding: Permanent turf for erosion control.
   6. Section 329223 - Sodding: Permanent turf for erosion control.
   7. Section 329300 - Plants: Permanent plantings for erosion control.

B. REFERENCE STANDARDS
   1. ASTM D 4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus; 2007.
   2. ASTM D 4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2004).
   3. ASTM D 4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2004.
   4. ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2008.
   5. ASTM D 4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2004.

6. ASTM D 4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2002.
7. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; current edition.
8. FHWA FLP-94-005 - Best Management Practices for Erosion and Sediment Control; Federal Highway Administration; 1995.
9. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 1986.

1.05 PERFORMANCE REQUIREMENTS

A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP), whether the project is required by law to comply or not.

B. Also comply with all more stringent requirements of State of Kentucky Erosion and Sedimentation Control Manual.

C. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

E. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.

F. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

G. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
   1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
   2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

H. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
   1. Control movement of sediment and soil from temporary stockpiles of soil.
   2. Prevent development of ruts due to equipment and vehicular traffic.
   3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

I. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
   1. Prevent windblown soil from leaving the project site.
   2. Prevent tracking of mud onto public roads outside site.
   3. Prevent mud and sediment from flowing onto sidewalks and pavements.
   4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

J. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
   2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

K. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

L. Open Water: Prevent standing water that could become stagnant.

M. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.06 SUBMITTALS

A. NOI: Submit NOI to KPDES Branch, Division of Water, per attached instructions. A copy of the submitted NOI form shall be sent to the Architect and the Owner.

B. BMP: Submit BMP to appropriate regulatory agency. A copy shall be sent to the Architect and the Owner.

C. Subcontractor Signatures: Signatures of all subcontractors for approval stating that they have read, understand and that they intend to comply with the BMP. A copy of the signatures shall be submitted to the Architect and the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mulch: Use one of the following:
   1. Straw or hay.
   2. Wood waste, chips, or bark.
   3. Erosion control matting or netting.
   4. Cutback asphalt.
   5. Polyethylene film, where specifically indicated only.

B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

C. Bales: Air dry, rectangular straw bales.
   1. Cross Section: 14 by 18 inches, minimum.
   2. Bindings: Wire or string, around long dimension.

D. Bale Stakes: One of the following, minimum 3 feet long:
   1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
   2. Wood, 2 by 2 inches in cross section.

E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
   1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with

ASTM D 4751.
2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D 4491.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D 4632.
5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D 4632.
6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D 4533.
7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
8. Manufacturers:

F. Silt Fence Posts: One of the following, minimum 5 feet long:

G. Gravel: See Section 321123 for aggregate.

H. **Erosion Control Blanket - Blanket shall not include any plastic netting; fabric shall be bound with jute or cotton.**

PART 3 EXECUTION

3.01 Continuous Service: The sediment and erosion control items are to be installed prior to the commencement of all other construction activities on site. Continuous maintenance shall be required until the next contract has been signed. To transfer the Notice of Intent, a letter is to be written and signed by the new contractor. Once this letter has been received and approved by the Division of Water the Contractor's responsibility shall be relieved.

3.02 Prepare Daily Field Reports per BMP requirements. A sample form is attached. Submit to regulatory agency as required.

3.03 Prepare Erosion and Sediment Control Inspection and Maintenance Report Form weekly per BMP requirements. A sample form is attached. Submit to regulatory agency as required.

3.04 Remove temporary erosion sediment control measures when site is 95% stabilized. Seed and protect any disturbed areas with permanent grass protect mixture.

3.05 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.06 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.07 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.
1. Width: As required; 20 feet, minimum.
2. Length: 50 feet, minimum.
3. Provide at each construction entrance from public right-of-way.
4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.
1. Provide linear sediment barriers:
   a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
2. Space sediment barriers with the following maximum slope length upslope from barrier:
   a. Slope of Less Than 2 Percent: 100 feet..
   b. Slope Between 2 and 5 Percent: 75 feet.

c. Slope Between 5 and 10 Percent: 50 feet.
d. Slope Between 10 and 20 Percent: 25 feet.
e. Slope Over 20 Percent: 15 feet.

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
2. Straw bale row blocking entire inlet face area; anchor into pavement.

E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

G. Soil Stockpiles: Protect using one of the following measures:
1. Cover with polyethylene film, secured by placing soil on outer edges.
2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
2. Asphalt: Use only where no traffic, either vehicular or pedestrian, is anticipated.

I. Temporary Seeding: Use where temporary vegetated cover is required.

3.08 INSTALLATION

A. Traffic-Bearing Aggregate Surface:
1. Excavate minimum of 6 inches.
2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.

B. Silt Fences:
1. Store and handle fabric in accordance with ASTM D 4873.
2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
5. Install with top of fabric at nominal height and embedment as specified.
6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
7. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

C. Straw Bale Rows:
1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
2. Install bales so that bindings are not in contact with the ground.
3. Embed bales at least 4 inches in the ground.
4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
5. Fill gaps between ends of bales with loose straw wedged tightly.

6. Place soil excavated for trench against bales on the upslope side of the row, compacted.

D. Temporary Seeding:
   1. When hydraulic seeder is used, seedbed preparation is not required.
   2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
   3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
   4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
   5. Incorporate fertilizer into soil before seeding.
   6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep deep.
   7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
   8. Repeat irrigation as required until grass is established.

3.09 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:
   1. Promptly replace fabric that deteriorates unless need for fence has passed.
   2. Remove silt deposits that exceed one-third of the height of the fence.
   3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Straw Bale Rows:
   1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
   2. Remove silt deposits that exceed one-half of the height of the bales.
   3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Clean out temporary sediment control structures weekly and relocate soil on site.

F. Place sediment in appropriate locations on site; do not remove from site.

3.10 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SECTION 313116 TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chemical soil treatment.

1.02 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for additional unit price requirements.

1.03 REFERENCE STANDARDS

A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; United States Code; 1947 (Revised 2001).

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.

C. Test Reports: Indicate regulatory agency approval reports when required.

D. Manufacturer's Certificate: Certify that toxicants meet or exceed specified requirements.

E. Certificate of compliance from authority having jurisdiction indicating approval of toxicants.

F. Record moisture content of soil before application.

G. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing this type of work and:
   1. Having minimum of 2 years documented experience.
   2. Approved by manufacturer of treatment materials.
   3. Licensed in Lexington, Kentucky.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year installer's warranty against damage to building caused by termites.
   1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufacturers:
   1. Bayer Environmental Science Corp: www.nobugs.com.
   2. FMC Professional Solutions: www.fmcprosolutions.com.
   3. Syngenta Professional Products: www.syngentaprofessionalproducts.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Toxicant Chemical: EPA approved; synthetically color dyed to permit visual identification of treated soil.

C. Diluent: Recommended by toxicant manufacturer.

2.02 MIXES

A. Mix toxicant to manufacturer's instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

B. Verify final grading is complete.

3.02 APPLICATION

A. Comply with requirements of U.S. EPA and applicable state and local codes.

B. Spray apply toxicant in accordance with manufacturer's instructions.

C. Apply toxicant at following locations:
   1. Under Slabs-on-Grade.
   2. In Crawl Spaces.
   3. At Both Sides of Foundation Surface.
   4. Soil Within 10 feet of Building Perimeter For a Depth of 1 feet.

D. Under slabs, apply toxicant immediately prior to installation of vapor barrier.

E. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.

F. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

G. Re-treat disturbed treated soil with same toxicant as original treatment.

H. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 PROTECTION

A. Do not permit soil grading over treated work.

END OF SECTION

SECTION 321123 - AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Paving aggregates.

1.02 RELATED REQUIREMENTS

A. Section 312200 - Grading: Preparation of site for base course.

B. Section 312323 - Fill: Compacted fill under base course.

C. Section 312316.13 - Trenching: Compacted fill over utility trenches under base course.

D. Section 330513 - Manholes and Structures: Manholes including frames.

E. Section 321216 - Asphalt Paving: Binder and finish asphalt courses.

F. Section 321313 - Concrete Paving: Finish concrete surface course.

G. Section 321416 - Brick Unit Paving.

H. Section 321413 - Precast Concrete Unit Paving.

I. Section 321440 - Stone Paving.

J. Section 321423 - Asphalt Unit Paving.

K. Section 321713 - Parking Bumpers: Concrete bumpers.

L. Section 312323 - Fill: Topsoil fill at areas adjacent to aggregate base course.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for general requirements applicable to unit prices for earthwork.

B. Coarse Aggregate: By the cubic yard. Includes supplying aggregate material, stockpiling, scarifying substrate surface, placing, and compacting.

C. Fine Aggregate: By the cubic yard. Includes supplying aggregate material, stockpiling, scarifying substrate surface, placing where required, and compacting.

1.04 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; American Association of State Highway and Transportation Officials; 1965 (2004).

B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2001 (2004).

C. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

D. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2007.

E. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

F. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2007.

G. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

H. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2006.

I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

J. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

K. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2005.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Materials Sources: Submit name of imported materials source.

C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

D. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

PART 2 PRODUCTS

2.01 MATERIALS

A. Coarse Aggregate: Coarse aggregate, conforming to State of Kentucky Highway Department standard.

B. Fine Aggregate: Sand; conforming to State of Kentucky Highway Department standard.

C. Geotextile Fabric: Non-biodegradable, woven.

2.02 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.

B. Where aggregate materials are specified using ASTM D 2487 classification, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

A. Place aggregate in maximum 4 inch layers and roller compact to specified density.

B. Level and contour surfaces to elevations and gradients indicated.

C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation From Design Elevation: Within 1/2 inch.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.

B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556.

C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade.

3.06 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Kentucky Transportation Cabinet (KYTC) Standard Specifications for Road and Bridge Construction, latest edition, and Supplemental Specifications to the Standard Specifications.

1.2 SUMMARY

A. Section Includes:

1. Asphalt surface treatments.
2. Cold milling of existing asphalt pavement.
3. Hot-mix asphalt patching.
4. Hot-mix asphalt paving.
5. Hot-mix asphalt overlay.

1.3 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
1. Job-Mix Designs: For each job mix proposed for the Work.

B. Qualification Data: For qualified manufacturer and Installer.

C. Material Test Reports: For each paving material.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by KYTC.

B. Installer Qualifications: Must have Certificate of Eligibility from the Kentucky Transportation Cabinet

C. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

D. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the Standard Specifications of the Kentucky Transportation Cabinet for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

E. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
b. Review condition of subgrade and preparatory work.
c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
3. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
4. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, complying with KYTC Standard Specifications Section 805.

C. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel or combinations thereof, complying with KYTC Standard Specifications Section 804.

1. For hot-mix asphalt, limit natural sand to a maximum of 10 percent by weight of the total aggregate mass.

D. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.

E. Recycled (Reclaimed) Asphalt Pavement (RAP): Milled or removed asphalt pavement may be utilized in accordance with KYTC Standard Specifications Section 409.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO MP 1a, PG 64-22. The Contractor may utilize PG 58-28 when asphalt mixture contains more than 15% RAP.

B. Prime Coat: ASTM D 2027, medium-curing cutback asphalt, MC-30 or MC-70.

C. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

D. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

B. Sand: AASHTO M 29, Grade Nos. 2 or 3.

C. Paving Geotextile: AASHTO M 288, nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.

2.4 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes meeting requirements of the Kentucky Transportation Cabinet (KYTC) or Asphalt Institute (AI) MS-2 and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Base Course: KYTC mixture designation Class 1 Base or a Marshall mixture from AI MS-2. There shall be no restrictions on polish resistant aggregates (utilize KYTC Type “D” aggregates). Recycled Asphalt Pavement may be utilized in accordance with KYTC Standard Specifications Section 409.
3. Surface Course: KYTC mixture designation Class 1 Surface or a Marshall mixture from AI MS-2. The mixture gradation may pass through the restricted zone and there shall be no restriction on polish resistant aggregates (utilize KYTC Type “D” aggregates). Recycled Asphalt Pavement (RAP) may be utilized in accordance with KYTC Standard Specifications Section 409.

B. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes designed according to procedures established by the Kentucky Transportation Cabinet (KYTC) or Asphalt Institute (AI) MS-2 and complying with the following requirements.

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Provide mixes complying with composition, grading, and tolerance requirements in ASTM D 3515 for the following nominal, maximum aggregate sizes:

a. Base Course: Mixture with a nominal maximum aggregate size of .75 inch (19 mm) with a minimum voids in the mineral aggregate (VMA) of 12 percent.
b. Surface Course: Mixture with a nominal maximum aggregate size of 0.38 inch (9.5 mm) with a minimum VMA of 14 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction**,** repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

D. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.2 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
1. Sweep loose granular particles from surface of unbound aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m). Comply with provisions in KYTC Standard Specifications Section 406.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.3 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

1. Mill to a depth of **2 inches (50 mm)**.
2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, driveway aprons, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Patch surface depressions deeper than 1 inch (25 mm) after milling, before wearing course is laid.
7. Handle milled asphalt material according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."
8. Keep milled pavement surface free of loose material and dust.
9. Do not allow milled materials to accumulate on-site.

3.4 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

1. Undersealing: Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

D. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

E. Placing Patch Material: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.5 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of [**1/4 inch (6 mm)**].

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.6 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted. Comply with applicable provisions of KYTC Standard Specifications Section 403 for delivery, placement, spreading and the compaction of the mixture.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at minimum temperature of 250 deg F (121 deg C).
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).

4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.8 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch (13 mm).
2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch (6 mm).
2. Surface Course: 1/8 inch (3 mm).
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

C. Design for a minimum fall of 1% to facilitate drainage (2% recommended).

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

    a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than 3 cores taken.
    b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.11 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION 321216

SECTION 321313 - CEMENT CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. KYTC Specification Division 500 “PCC Pavement and Non-Structural Concrete Construction”

1.2 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:

1. Service Areas.
2. Curbs and gutters.
3. Walkways.
4. Concrete Stairs and ramps.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.
2. Division 2 Section "Pavement Joint Sealants" for joint sealants within concrete pavement and at isolation joints of concrete pavement with adjacent construction.
3. Division 3 Section "Cast-in-Place Concrete" for general building applications of concrete.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Samples: 12”x12” sample panel to show exposed aggregate finish. (If exposed aggregate concrete is shown on plans)

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials and aggregates.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Applied finish materials.

6. Bonding agent or adhesive.
7. Joint fillers.

F. Preinstallation conference and minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

E. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.

G. Mockups: Cast mockups of full-size sections of concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Engineer.
2. Notify Engineer seven days in advance of dates and times when mockups will be constructed.
3. Obtain Engineer's approval of mockups before starting construction.
4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
5. Demolish and remove approved mockups from the site when directed by Engineer.
6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1. Before submitting design mixes, review concrete pavement mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with concrete pavement to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixes.
d. Concrete subcontractor.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves of a radius 100 feet (30.5 m) or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.

C. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

D. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars; assembled with clips.

E. Plain Steel Wire: ASTM A 82, as drawn.

F. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.

G. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

H. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

I. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Portland Cement: ASTM C 150, Type I or II.

1. Fly Ash: ASTM C 618, Class F or C.
2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:

1. Class: 4S.
2. Class: 4M.
3. Class: 1N.
4. Maximum Aggregate Size: 1 inch (25 mm) nominal.
5. Exposed aggregate: Gravel washed natural mineral aggregate, .5 inch minimum and 1 inch maximum size, natural reds and browns color range from a single source. Provide samples for color selection and approval by Owner. (If applicable to project)
5. Do not use fine or coarse aggregates containing substances that cause spalling.

I. Water: ASTM C 94.

2.4 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

2.5 FIBER REINFORCEMENT (Not Applicable)

2.6 CURING MATERIALS – ALL PRODUCTS SHALL BE FROM NEW SEALED CONTAINERS. CONTRACTOR SHALL NOTIFY ARCHITECT AFTER 28 DAY CURING PERIOD TO ARRANGE A PREINSTALLATION MEETING AND INSPECTION OF WALK FOR ACCEPTANCE PRIOR TO APPLICATION OF SILANE.

A. Absorptive Cover: Non Staining Burlene 10 oz. burlap combined with the moisture-retention and reflective features of 4 mil white opaque poly, extruded into burlap or equal (install and use per manufacturer's recommendations)
B. Moisture-Retaining Cover: Non Staining Burlene 10 oz. burlap combined with the moisture-retention and reflective features of 4 mil white opaque poly, extruded into burlap or equal (install and use per manufacturer's recommendations)

C. Water: Potable. BE CERTAIN NO WATER IS IN LINES FOR PUMPS OR SPRAYERS PRIOR TO APPLICATION OF SILANE.

D. Evaporation Retarder: Waterborne, NON-film/membrane forming, manufactured for application to fresh concrete.

E. Clear Non Residual Waterborne Curing Compound: Discoloration or mottling of concrete is not acceptable and will require removal and replacement of concrete at contractor's expense. Contractor shall utilize non-film, non-membrane forming cure that is compatible with the penetrating silane sealer used on this project. Acceptable products are listed in this specification.

F. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

I. Products: Follow all manufacturer's installation guidelines and recommendations for pre and post preparation and clean up. Subject to compliance with requirements, provide one of the following:

1. Evaporation Retarder:

   a. L&M E-Con

2. Clear Resin Non-Residual Non-Membrane-Forming Curing Compound:

   a. L&M Cure (Cure R or Cure RZ are not acceptable)
   b. Sonneborn – Sonosil
   c. Chem-Rex Mastertop CST – (Jack Schwein-513-289-4867 cell)

3. Silane Water Repellant Penetrating Sealer:
   No rain 24 hours before and 48 hours after application– contractor shall schedule accordingly. Apply 28 days after placement. Follow all manufacturer's installation guidelines and recommendations – apply at rate of 150SF / gallon unless otherwise indicated

   a. EVONIK Protectosil CHEM-TRETE BSM 40 VOC - (Jack Schwein-513-289-4867 cell)
   b. BASF Hydrozo Clear 40 VOC
   c. Prosoco SL100

2.7 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.

C. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

D. Pavement-Marking Paint: Alkyd-resin type; ready mixed; complying with FS TT-P-115, Type I, or AASHTO M 248, Type N.

1. Color: Blue for handicapped requirements, yellow for fire lanes, white elsewhere.

E. Wheel Stops: Precast, air-entrained concrete; 2500-psi (17.2-MPa) minimum compressive strength; approximately 6 inches (150 mm) high, 9 inches (225 mm) wide, and 84 inches (2130 mm) long. Provide chamfered corners and drainage slots on underside, and provide holes for dowel-anchoring to substrate.

1. Dowels: Galvanized steel, diameter of 3/4 inch (19 mm), minimum length 10 inches (254 mm).

2.8 CONCRETE MIXES

A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.

1. Do not use Owner's field quality-control testing agency as the independent testing agency.

C. Proportion mixes to provide concrete with the following properties:

1. Compressive Strength (28 Days): 4500 psi.
2. Slump Limit: 3 to 4 inches.

D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:

1. Air Content: 6.0 percent for 1-inch (25-mm) maximum aggregate.

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.

B. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

C. Project-Site Mixing: Comply with requirements and measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixers of 1 cu. yd. (0.76 cu. m) or smaller capacity, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
2. For mixers of capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 PREPARATION

A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap to adjacent mats.

3.4 JOINTS

A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.

1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
3. Provide tie bars at sides of pavement strips where indicated.
4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet (15.25 m), unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler less than 1/2 inch (12 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

a. Radius: 1/4 inch (6 mm).

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

1. Radius: 1/4 inch (6 mm).

3.5 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery, at Project site, or during placement.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms.

Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer, or use bonding agent if approved by Engineer.

I. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.

J. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

K. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

L. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

M. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

N. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

3.7 SPECIAL FINISHES

A. Exposed Aggregate (submit samples for color approval by Owner) (if shown on plans)

1. Decorative aggregate shall be integral to concrete mix, not seeded on top of concrete.

2. Wash concrete surfaces to which surface retarder has been applied with clean water and scrub with stiff bristle brush exposing decorative aggregate to match sample panel.

3. Provide penetrating silane selaer per manufcaturers recommendations and specifications.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing. Film or membrane forming retarders are not acceptable.

C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Absorptive non-staining cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with non-staining moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

E. Provide penetrating silane selaer per manufcaturers recommendations and specificaitons.

3.9 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus 3/8 inch (9 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Owner.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

C. Testing Services: Testing shall be performed according to the following requirements:

1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m). One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
8. When total quantity of a given class of concrete is less than 50 cu. yd. (38 cu. m), Engineer may waive compressive-strength testing if adequate evidence of satisfactory strength is provided.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
10. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Engineer, Owner, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as the sole basis for approval or rejection.

F. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.13 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

B. Drill test cores where directed by Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

E. Do not use salt as de-icing or snow removal agent during first year after installation. Only use sand or other non-damaging de-icing agent as approved by Owner during the first year of use.

END OF SECTION 321313

SECTION 321373– CONCRETE PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. KYTC Specification Section 807.04 “Joint Fillers”

1.2 SUMMARY

A. This Section includes the following:

1. Expansion and contraction joints within portland cement concrete pavement.
2. Joints between portland cement concrete and asphalt pavement.
3. Joints between portland cement concrete and building structure.

1.3 SUBMITTALS
None required

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F (4.4 deg C).
3. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than that allowed by joint sealant manufacturer for application indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

A. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.

B. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

C. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.

D. Available Products: Subject to compliance with requirements, cold-applied joint sealants that may be incorporated into the Work include, but are not limited to, the following:

E. Products: Subject to compliance with requirements, provide one of the following:

1. Type NS Silicone Sealant for Concrete:

    a. Roadsaver Silicone-SL; Crafco Inc.
    b. 888; Dow Corning.

2. Type SL Silicone Sealant for Concrete and Asphalt:

    a. 890-SL; Dow Corning.

3. Multicomponent Low-Modulus Sealant for Concrete and Asphalt:

    a. SOF-SEAL; W.R. Meadows, Inc.

2.3 HOT-APPLIED JOINT SEALANTS

A. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3406.

B. Sealant for Concrete and Asphalt: Single-component formulation complying with ASTM D 3405.

C. Available Products: Subject to compliance with requirements, hot-applied joint sealants that may be incorporated into the Work include, but are not limited to, the following:

D. Products: Subject to compliance with requirements, provide one of the following:

1. Elastomeric Sealant for Concrete:

a. Superseal 444/777; Crafco, Inc.
b. POLY-JET 3406; W.R. Meadows, Inc.

2. Sealant for Concrete and Asphalt:

a. ROADSAVER 221; Crafco Inc.
b. Product #9005; Koch Materials Company.
c. Product #9030; Koch Materials Company.
d. SEALTIGHT HI-SPEC; W.R. Meadows, Inc.

2.4 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rod for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depths, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

2.5 PRIMERS

A. Primers: Product recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint- sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions applicable to products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of backer materials.
2. Do not stretch, twist, puncture, or tear backer materials.
3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants by proven techniques to comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.
2. Use tooling agents that are approved in writing by joint sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint sealant manufacturer's written instructions, unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 321373

SECTION 321723 - PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Parking lot markings, including parking bays, crosswalks, arrows, handicapped symbols, and curb markings.

B. Roadway lane markings and crosswalk markings.

C. "No Parking" curb painting.

D. Thermoplastic shall be used if markings are located within a street Right of Way. (Stop Bars, Crosswalks, Turn Arrows, Bike Lane Markings, etc) and as specified in the Contract Documents.

1.02 RELATED REQUIREMENTS

A. Section 321216 - Asphalt Paving.

B. Section 321313 - Concrete Paving.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012100 - Allowances, for cash allowances affecting this section.

1.04 REFERENCE STANDARDS

A. FS TT-B-1325 - Beads (Glass Spheres); Retro-Reflective; Rev. D, 2007.

B. FS TT-P-1952 - Paint, Traffic Black, and Airfield Marking, Waterborne; Rev. E, 2007.

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

D. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; http://mutcd.fhwa.dot.gov; current edition.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Certificates: Submit for each batch of paint and glass beads stating compliance with specified requirements.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Paint: 2 containers, 1 gallon size, of each type and color.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.

B. Deliver glass beads in containers suitable for handling and strong enough to prevent loss during shipment accompanied by batch certificate.

C. Store products in manufacturer's unopened packaging until ready for installation.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MATERIALS

A. Line and Zone Marking Paint: MPI No. 97 Latex Traffic Marking Paint; color(s) as indicated.
   1. Roadway Markings: As required by authorities having jurisdiction.
   2. Parking Lots: White.
   3. Handicapped Symbols: Blue.

B. Line and Zone Marking Paint: Refer to Section 099000.

C. Paint For Obliterating Existing Markings: FS TT-P-1952; black for bituminous pavements, gray for portland cement pavements.

D. Reflective Glass Beads: FS TT-B-1325, Type I (low index of refraction), Gradation A (coarse, drop-on); with silicone or other suitable waterproofing coating to ensure free flow.

E. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

F. Dual Zone usage mark per plans.

G. School Athletic / Band markings per plans or per owner's direction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Clean surfaces thoroughly prior to installation.
   1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.

D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

F. Temporary Pavement Markings: When required or directed by Architect, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.
   1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
   2. At Contractor's option, temporary marking tape may used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner.

3.03 INSTALLATION

A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

D. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) for details not shown.

E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.

F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends.
   1. Apply paint in two coats for permanent applications. Apply one coat only for temporary striping applications.
   2. Wet Film Thickness: 0.015 inch, minimum.
   3. Length Tolerance: Plus or minus 3 inches.
   4. Width Tolerance: Plus or minus 1/8 inch.

G. Roadway Traffic Lanes: Use suitable mobile mechanical equipment that provides constant agitation of paint and travels at controlled speeds.
   1. Conduct operations in such a manner that necessary traffic can move without hindrance.
   2. Place warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic.
   3. If paint does not dry within expected time, discontinue paint operations until cause of slow drying is determined and corrected.
   4. Skip Markings: Synchronize one or more paint "guns" to automatically begin and cut off paint flow; make length of intervals as indicated.
   5. Use hand application by pneumatic spray for application of paint in areas where a mobile paint applicator cannot be used.
   6. Distribute glass beads uniformly on the paint lines within ten seconds without any waste, applied at rate of 6 pounds per gallon of paint; if the marking equipment does not have a glass bead dispenser, use a separate piece of equipment adjusted and synchronized with the paint applicator; remove and replace markings having faulty distribution of beads.

H. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
   1. Mark the International Handicapped Symbol at indicated parking spaces.
   2. Hand application by pneumatic spray is acceptable.

I. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

3.04 DRYING, PROTECTION, AND REPLACEMENT

A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.

B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.

C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.

D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.

E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.

F. Replace removed markings at no additional cost to Owner.

END OF SECTION

SECTION 323113 - CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Galvanized steel chain-link fabric.
2. Zn-5-Al-MM alloy-coated, steel chain-link fabric.
3. PVC-coated, steel chain-link fabric.
4. Galvanized steel framework.
5. Polymer-coated steel framework.

B. Related Sections include the following:

1. “Earthwork” for filling and for grading work.

1.3 DEFINITIONS

A. CLFMI: Chain Link Fence Manufacturers Institute.

B. Zn-5-Al-MM Alloy: Zinc-5 percent aluminum-mischmetal alloy.

1.4 SUBMITTALS

A. Product Data: Material descriptions, construction details, dimensions of individual components and profiles, and finishes for the following:

1. Fence and gate posts, rails, and fittings.
2. Chain-link fabric, reinforcements, and attachments.
3. Gates and hardware.

B. Shop Drawings: Show locations of fence, each gate, posts, rails, and tension wires and details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, elevations, sections, gate swing and other required installation and operational clearances, and details of post anchorage and attachment and bracing.

C. Samples for Initial Selection: Manufacturer's color charts or 6-inch (150-mm) lengths of actual units showing the full range of colors available for components with factory-applied color finishes.

D. Product Certificates: Signed by manufacturers of chain-link fences and gates certifying that products furnished comply with requirements.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Field Test Reports: Indicate and interpret test results for compliance of chain-link fence and gate grounding and bonding with performance requirements.

G. Maintenance Data: For the following to include in maintenance manuals specified in Division 1:

1. Polymer finishes.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.

C. Source Limitations for Chain-Link Fences and Gates: Obtain each color, grade, finish, type, and variety of component for chain-link fences and gates from one source with resources to provide chain-link fences and gates of consistent quality in appearance and physical properties.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

B. Field Measurements: Verify layout information for chain-link fences, poles and netting and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include
   1. Master Halco
   2. Ameristar
   3. Sportsfield Specialties

2.2 CHAIN-LINK FENCE FABRIC

A. Steel Chain-Link Fence Fabric: Height indicated on Drawings. Provide fabric fabricated in one-piece widths for fencing in height of 12 feet (3.6 m) and less. Comply with CLFMI's "Product Manual" and with requirements indicated below:

   1. Mesh and Wire Size: 2” mesh, (9 ga core, 6 ga finish) PVC-coated wire unless indicated otherwise on Drawings (use 1-3/4” mesh, 9 ga core, 6 ga finish for tennis court fencing).
   2. Zinc-Coated Fabric: ASTM A 392, with zinc coating applied to steel wire before weaving according to ASTM A 817, Type II, zinc coated (galvanized) with the following minimum coating weight:

      a. Class 1: Not less than 1.2 oz./sq. ft. (366 g/sq. m) of uncoated wire surface.
   3. Zn-5-Al-MM Alloy-Coated Fabric: ASTM F 1345, with metallic coating Type III, Zn-5-Al-MM alloy coated, applied to steel wire according to ASTM A 817 with the following minimum coating weight:

      a. Class 1: Not less than 0.60 oz./sq. ft. (183 g/sq. m) of uncoated wire surface.

   4. PVC-Coated Fabric: ASTM F 668, Class [1] over metallic-coated steel wire.

      a. Metallic Coating: Zinc, Zn-5-Al-MM alloy.
      b. Color: Black complying with ASTM F 934.

   5. Coat selvage ends of fabric that is metallic coated during the weaving process with manufacturer's standard clear protective coating.

B. Selvage: Knuckled at both selvages.

2.3 INDUSTRIAL FENCE FRAMING

A. Round Steel Pipe: Standard weight, Schedule 40, galvanized steel pipe complying with ASTM F 1083. Comply with ASTM F 1043, Material Design Group IA, external and internal coating Type A, consisting of not less than 1.8-oz./sq. ft. (0.55-kg/sq. m) zinc; and the following strength and stiffness requirements:

Line, End, Corner, and Pull Posts and Top Rail: Per requirements for Light Industrial Fence.

- Gate Posts shall be: 4” diameter SS40 for 10’ tall fence, 3” diameter SS40 for 8’ tall fence and 2-1/2” diameter SS40 for 5’ tall fence. Use 4” diameter SS40 for 8’ tall double swing gates.
- Corner posts shall be 4” diameter SS40 for 10’ tall fence and 3” diameter SS40 for 5’ and 8’ tall fence
- Line Posts shall be 3” diameter SS40 for 10’ tall fence, 2-1/2” diameter for 5’ and 8’ tall fence (8’ max. spacing)
- All gate Framing shall be 2” diameter SS40
- All horizontal rails shall be 1-5/8” diameter SS40 (top rails shall be SS20)

B. Round Steel Pipe: Cold-formed, electric-resistance-welded steel pipe. Comply with ASTM F 1043, Material Design Group IC, with minimum yield strength of 50,000 psi (344 MPa); and the following external and internal coatings and strength and stiffness requirements:

1. Coatings: Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film.
2. Coatings: External, Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film. Internal, Type D, consisting of 81 percent, not less than 0.3-mil- (0.0076-mm-) thick, zinc pigmented coating.
3. Coatings: Type C, Zn-5-Al-MM alloy, consisting of not less than 1.8-oz./sq. ft. (0.55-kg/sq. m) coating.
4. Coatings: PVC black or galvanized as indicated on drawings.

C. Post Brace Rails: Match top rail for coating and strength and stiffness requirements. Provide brace rail with truss rod assembly for each gate, end, and pull post. Provide two brace rails extending in opposing directions, each with truss rod assembly, for each corner post and for pull posts. Provide rail ends and clamps for attaching rails to posts.

D. Top Rails: Fabricate top rail from lengths 21 feet (6.4 m) or longer, with swedged-end or fabricated for expansion-type coupling, forming a continuous rail along top of chain-link fabric.

E. Intermediate Rails: Match top rail for coating and strength and stiffness requirements.

F. Bottom Rails: Match top rail for coating and strength and stiffness requirements.

G. Extended Members: Extend posts above top of chain-link fabric as indicated on Drawings or as required to attach assemblies.

2.4 TENSION WIRE

A. General: Provide horizontal tension wire at the following locations:
1. As indicated on Drawings.

B. Metallic-Coated Steel Wire: 0.177-inch- (4.5-mm-) diameter, marcelled tension wire complying with ASTM A 824 and the following:

1. Coating: Type I, aluminum coated (aluminized).
2. Coating: Type II, zinc coated (galvanized) by the hot-dip process, with the following minimum coating weight:
   a. Matching chain-link fabric coating weight.

3. Coating: Type III, Zn-5-Al-MM alloy with the following minimum coating weight:
   a. Matching chain-link fabric coating weight.

2.5 INDUSTRIAL SWING GATES

A. General: Comply with ASTM F 900 for the following swing-gate types:

1. Single gate.
2. Double gate.

B. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1083 and ASTM F 1043 for materials and protective coatings.

C. Metal Pipe and Tubing: Aluminum. Comply with ASTM B 429 and ASTM F 1043 for materials and protective coatings.

D. Frames and Bracing: Fabricate members from round tubing with outside dimension and weight according to ASTM F 900 for the following gate fabric height:

1. Gate Fabric Height: 6 feet (1.83 m) or less.
2. Gate Fabric Height: More than 6 feet (1.83 m).

E. Frame Corner Construction: As follows:

1. Welded.
2. Assembled with corner fittings [and 5/16-inch- (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider].
3. Welded or assembled with corner fittings [and 5/16-inch- (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider].

F. Gate Posts: Fabricate members from round aluminum pipe with outside dimension and weight according to ASTM F 900 for the following gate fabric heights and leaf widths:

1. Gate Fabric Height by Leaf Width: 6 feet (1.83 m) or less by 4 feet (1.22 m) or less.
2. Gate Fabric Height by Leaf Width: 6 feet (1.83 m) or less by over 4 feet (1.22 m) but not over 10 feet (3.05 m).
3. Gate Fabric Height by Leaf Width: 6 feet (1.83 m) or less by over 10 feet (3.05 m) but not over 18 feet (5.49 m).
4. Gate Fabric Height by Leaf Width: Over 6 feet (1.83 m) by 6 feet (1.83 m) or less.
5. Gate Fabric Height by Leaf Width: Over 6 feet (1.83 m) by over 6 feet (1.83 m) but not over 12 feet (3.66 m).

G. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame as indicated on Drawings or as required to attach assemblies.

H. Hardware: Latches permitting operation from both sides of gate, hinges, center gate stops and, for each gate leaf more than 5 feet (1.5 m) wide, keepers. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

2.6 FITTINGS

A. General: Provide fittings for a complete fence installation, including special fittings for corners. Comply with ASTM F 626.

B. Post and Line Caps: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron. Provide weathertight closure cap for each post. Prime and paint to match fence fabric.

1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron. Provide rail ends or other means for attaching rails securely to each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Hot-dip galvanized pressed steel or round steel tubing. Not less than 6 inches (153 mm) long.

2. Rail Clamps: Hot-dip galvanized pressed steel. Provide line and corner boulevard clamps for connecting intermediate and/or bottom rails in the fence line to line posts.

E. Tension and Brace Bands: Hot-dip galvanized pressed steel.

2.7 CAST-IN-PLACE CONCRETE

A. General: Comply with ACI 301 for cast-in-place concrete.

B. Materials: Portland cement complying with ASTM C 150, aggregates complying with ASTM C 33, and potable water Measure, batch, and mix Project-site-mixed concrete according to ASTM C 94.

1. Concrete Mixes: Normal-weight concrete air entrained with not less than 3000-psi (20.7-MPa) compressive strength (28 days), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum size aggregate.

C. Materials: Dry-packaged concrete mix complying with ASTM C 387 for normal-weight concrete mixed with potable water according to manufacturer's written instructions.

2.8 GROUT AND ANCHORING CEMENT

A. Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

2.9 POLYMER FINISHES

A. Supplemental Color Coating: In addition to specified metallic coatings for steel, provide fence components with polymer coating.

B. Metallic-Coated Steel Tension Wire: PVC-coated wire complying with ASTM F 1664, Class 2b.

C. Metallic-Coated Steel Framing: Comply with ASTM F 1043 for polymer coating applied to exterior surfaces and, except for tubular shapes, to exposed interior surfaces.

1. Polymer Coating: Not less than 10-mil- (0.254-mm-) thick PVC or 3-mil- (0.076-mm-) thick polyester finish.

D. Fittings, Post and Line Caps, Rail and Brace Ends, Top Rail Sleeves, Tension and Brace Bands, Tension Bars, Truss Rod Assemblies, Tie Wires, Clips, and Fasteners: Comply with ASTM F 626 for polymer coating applied to exterior surfaces and, except inside cap shapes, to exposed interior surfaces.

1. Polymer Coating: Not less than 10-mil- (0.254-mm-) thick PVC.

E. Color: Black complying with ASTM F 934.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.

1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

A. General: Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

1. Install fencing on established boundary lines inside property line or unless indicated otherwise on drawings.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.

C. Post Setting: Hand-excavate holes for post foundations in firm, undisturbed or compacted soil. Set terminal, line, gate posts in concrete footing. Protect portion of posts aboveground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Using mechanical devices to set line posts per ASTM F 567 is permitted. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured.

1. Dimensions and Profile: As indicated on Drawings.
2. Exposed Concrete Footings: Extend concrete 2 inches (50 mm) above grade, smooth, and shape to shed water.
3. Concealed Concrete Footings: Stop footings below grade as indicated on Drawings to allow covering with surface material.
4. Posts Set into Concrete in Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.
5. Posts Set into Concrete in Voids: Form or core drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.

3.4 CHAIN-LINK FENCE INSTALLATION

Use of tension wires versus top and bottom rails varies on this project depending on fence application. Refer to drawings for which fence requires tension wire and which fence requires top and bottom rail.

A. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of as indicated on Drawings.

B. Line Posts: Space line posts uniformly at 8 feet (2.44 m) o.c.

C. Post Bracing Assemblies: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts. Locate horizontal braces at midheight of fabric on fences with top rail and at two-thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

D. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- (3.05-mm-) diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches (609 mm) o.c. Install tension wire in locations indicated before stretching fabric.

1. Top Tension Wire: Install tension wire through post cap loops.
2. Bottom Tension Wire: Install tension wire within 6 inches (150 mm) of bottom of fabric and tie to each post with not less than same gage and type of wire.

E. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended by fencing manufacturer.

F. Intermediate Rails: Install in one piece at as indicated on Drawings, spanning between posts, using fittings, special offset fittings, and accessories.

G. Bottom Rails : Install, spanning between posts, using fittings and accessories. Refer to detail drawings for locations.

H. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2 inches (50 mm) between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches (380 mm) o.c.

J. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts 12 inches (304 mm) o.c. and to braces 24 inches (609 mm) o.c.

K. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side.

3.5 GATE INSTALLATION

A. General: Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

3.7 ACCESSORIES

A. Install post caps and other accessories to complete fence.

3.8.1 CLEANING

A. Clean up debris and unused material, and remove from site

END OF SECTION 323113

SECTION 330513 - MANHOLES AND STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Monolithic concrete manholes with masonry transition to lid frame, covers, anchorage, and accessories.

B. Modular precast concrete manhole sections with tongue-and-groove joints with masonry transition to lid frame, covers, anchorage, and accessories.

C. Monolithic FRP manholes with transition to lid frame, covers, anchorage, and accessories.

D. Masonry manhole sections with masonry transition to lid frame, covers, anchorage, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 042000 - Unit Masonry: Masonry units and mortar and grout.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for additional unit price requirements.

1.04 REFERENCE STANDARDS

A. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 2005.

B. ASTM A 48/A 48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2008).

C. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2002.

D. ASTM C 55 - Standard Specification for Concrete Brick; 2006.

E. ASTM C 478 - Standard Specification for Precast Reinforced Concrete Manhole Sections; 2009.

F. ASTM C 478M - Standard Specification for Precast Reinforced Concrete Manhole Sections [Metric]; 2009.

G. ASTM C 923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals; 2008.

H. ASTM C 923M - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals [Metric]; 2008b.

I. ASTM C 1634 - Standard Specification for Concrete Facing Brick; 2006.

J. ASTM D 3753 - Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells; 2005.

K. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; 1993.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate manhole locations, elevations, piping sizes and elevations of penetrations.

C. Product Data: Provide manhole covers, component construction, Lettering requirements for Manhole Lids, features, configuration, and dimensions.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.07 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manhole Sections: Reinforced precast concrete in accordance with ASTM C 478 (ASTM C 478M), with resilient connectors complying with ASTM C 923 (ASTM C 923M).

B. Manhole Sections: ASTM D 3753, glass-fiber reinforced polyester with integral steps.

C. Concrete: As specified in Section 033000.

D. Mortar and Grout: As specified in Section 042000, Type S.

E. Concrete Reinforcement: As specified in Section 033000.

2.02 COMPONENTS

A. Lid and Frame: ASTM A 48/A 48M, Class 30B Cast iron construction, machined flat bearing surface, removable lockable lid, closed lid design; live load rating of meeting or exceeding H-20 loading; sealing gasket; lid molded with identifying name ;.

B. Manhole Steps: Formed galvanized steel rungs; 3/4 inch diameter. Formed integral with manhole sections.

2.03 CONFIGURATION

A. Shaft Construction: Concentric with concentric cone top section; lipped male/female joints; sleeved to receive pipe sections.

B. Shape: Cylindrical.

C. Clear Inside Dimensions: 48 inch minimum diameter.

D. Design Depth: As indicated.

E. Clear Lid Opening: 26 inches diameter.

F. Pipe Entry: Provide openings as indicated.

G. Steps: As required by local code and details of authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Verify excavation for manholes is correct.

3.02 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.03 MANHOLES

A. Place concrete base pad, trowel top surface level.

B. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.

C. Form and place manhole cylinder plumb and level, to correct dimensions and elevations. As work progresses, build in connections as necessary.

D. Cut and fit for pipe.

E. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

F. Set cover frames and covers level without tipping, to correct elevations.

G. Coordinate with other sections of work to provide correct size, shape, and location.

3.04 MASONRY WORK

A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

B. Lay masonry units in running bond. Course one unit and one mortar joint to equal 8 inches.

C. Form concave mortar joints.

D. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

E. Install joint reinforcement 16 inches on center.

F. Place joint reinforcement in first and second horizontal joints above base pad and below lid frame opening.

3.05 SCHEDULES

A. Storm Sewer Manholes: Precast concrete sections, galvanized steel steps, 48 inch inside dimension, to depth indicated, with bolted lid.

B. Electric Service Manholes: Prefabricated FRP sections, integral molded steps, 60 inch inside dimension, to depth indicated.

END OF SECTION

SECTION 334100 - STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes storm drainage and detention outside the building.

1.3 DEFINITIONS

A. PE: Polyethylene plastic - ADS-N12, A2000 or equal.

B. PVC: Polyvinyl chloride plastic.

C. RCP: Reinforce concrete pipe. Class III

1.4 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.5 SUBMITTALS

A. Shop Drawings: Provide hard copy and acad 2007 compatible files for plans, elevations, details, and attachments for the following:

1. Precast concrete manholes and other structures, including frames, covers, and grates.
2. Cast-in-place concrete manholes and other structures, including frames, covers, and grates
3. Underground storage chambers system.

B. Provide maintenance procedures manual for the cleaning of the stormwater system. This includes the water quality units and the strom water detention system.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Site Information: Research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Pre-cast concrete
      a. Sherman Dixie
      b. Old Castle
      c. Cloud
   2. PVC Pipe
      a. North American Pipe
      b. Crestline Plastic Pipe

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.3 PIPES AND FITTINGS

A. Corrugated PE Drainage Tubing and Fittings: AASHTO M 252, Type S, with smooth waterway for coupling joints.

   1. Soiltight Couplings: AASHTO M 252, corrugated, matching tube and fittings to form soiltight joints.

   2. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings to form silttight joints.

B. Corrugated PE Pipe and Fittings: AASHTO M 294, Type S, with smooth waterway for coupling joints.

   1. Soiltight Couplings: AASHTO M 294, corrugated, matching pipe and fittings to form soiltight joints.

      3. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings to form silttight joints.

C. PVC Pressure Pipe: AWWA C900, Class 150, for gasketed joints.

   1. PVC Pressure Fittings: AWWA C907, for gasketed joints.
   2. Gaskets for PVC Piping: ASTM F 477, elastomeric seals.
   3. Ductile-Iron, Compact Fittings: AWWA C153, for push-on joints.
   4. Gaskets for Ductile-Iron Fittings: AWWA C111, rubber.

D. Cellular-Core PVC Pipe: ASTM F 891, Sewer and Drain Series, PS 50 minimum stiffness, for solvent-cemented joints.

1. Fittings: ASTM D 2729 or ASTM D 3034, PVC sewer pipe fittings.

C. PVC Sewer Pipe and Fittings: According to the following:

1. PVC Sewer Pipe and Fittings, NPS 15 (DN375) and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.

a. Gaskets: ASTM F 477, elastomeric seals.

2. PVC Sewer Pipe and Fittings, NPS 18 (DN450) and Larger: ASTM F 679, T-1 wall thickness, bell and spigot for gasketed joints.

a. Gaskets: ASTM F 477, elastomeric seals.

E. PVC, Ribbed Drain Pipe: AASHTO M 304M, bell and spigot, with smooth waterway for bell-gasketed joints.

1. Fittings: AASHTO M 304M or ASTM F 794 for bell-gasketed joints.
2. Gaskets: ASTM F 477, elastomeric seals to form soiltight joints.

F. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76 (ASTM C 76M), Class III, Wall B, for gasketed joints.

1. Gaskets: ASTM C 443 (ASTM C 443M), rubber.

2.4 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.

1. Sleeve Material for Concrete Pipe: ASTM C 443 (ASTM C 443M), rubber.
2. Sleeve Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
3. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.
4. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.
5. Bands: Stainless steel, at least one at each pipe insert.

B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for nonpressure joints.

1. Material for Concrete Pipe: ASTM C 443 (ASTM C 443M), rubber.
2. Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
3. Material for Plastic Pipe: ASTM F 477, elastomeric seal.
4. Material for Dissimilar Pipe: Compatible with pipe materials being joined.

2.5 PE FILM, PIPE ENCASEMENT (Not Applicable)

2.6 MANHOLES (Not Applicable)

2.7 CATCH BASINS AND MANHOLES

A. Precast Concrete Catch Basins and Manholes: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth shape and dimensions indicated, with provision for rubber gasketed joints, and as required by authorities having jurisdiction.

B. Cast-in-Place Concrete, Catch Basins and Manholes: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.

1. Bottom, Walls, and Top: Reinforced concrete.
2. Channels and Benches: Concrete.

C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service, unless otherwise shown on the drawings. Include flat grate with small square or short-slotted drainage openings.

2.8 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cementitious ratio.

1. Include channels in catch basins.

a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

1) Invert Slope: 1 percent through catch basin.

2.9 PROTECTIVE COATINGS

A. Description: One- or two-coat, coal-tar epoxy; 15-mil (0.38-mm) minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:

1. Manhole Frames and Covers: On entire surfaces.
2. Catch Basin Frames and Grates: On entire surfaces.

2.10 STORMWATER DETENTION CHAMBER SYSTEM

A. Chamber options
   a. Chambers designed in accordance with ASTM F2787 for structural requirements
   b. Chambers designed in accordance with ASTM 2418 Standards for PP stormwater collection chambers

B. The contractor shall submit a structural evaluation by a registered structural engineer that demonstrates that the safety factors specified in the AASHTO LRFD Bridge Design Specifications, Section 12.12 are met. The 50-year creep modulus data specified in ASTM

F 2418 must be used as part of the AASHTO structural evaluation to verify long-term performance.

C. Design loading for the chambers shall meet or exceed AASHTO HS-20 loading.

D. Chambers shall have open bottomed arch shaped section profile, providing continuous unobstructed internal space with no internal support panels in order to provide ease of access for inspection and maintanence.

E. Contractor shall submit design summary by the manufacturer that demonstrates that the system is designed to convey peak flow rates without scour of foundation stone

F. Chambers and end caps shall be injection molded from virgin polypropylene resin.

G. All chamber rows shall have end caps

2.11 PIPE OUTLETS

A. Head Walls: Cast-in-place or precast reinforced concrete, with apron (as shown on the drawings.)

B. Riprap Basins: Broken, irregular size and shape, graded stone.

1. Average Size: KTC, Class II channel lining.

C. Filter Stone: KTC #8, #9 or 9M graded stone.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Specification Section "Earthwork."

3.2 IDENTIFICATION

A. Materials and their installation are specified in Specification Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 PIPING APPLICATIONS

A. General: Include watertight, silttight, or soiltight joints, unless watertight or silttight joints are indicated.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:

1. NPS 8 to NPS 18 (DN200 to DN375): PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.

2. NPS 18 to NPS 36 (DN450 to DN900): Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.

D. Force-Main Piping: Use the following: (Not Applicable)

3.4 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for nonpressure applications:

a. Sleeve type to join piping, of same size, or with small difference in OD.
b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.

B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.5 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
2. Install piping with 24-inch (600-mm) minimum cover.

F. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Install with top surfaces of components, except piping, flush with finished surface.

C. PVC Sewer Pipe and Fittings: As follows:

1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
2. Install according to ASTM D 2321.

D. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:

1. Round Pipe and Fittings: ASTM C 443 (ASTM C 443M), rubber gaskets.

E. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

F. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.7 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches (76 mm) above finished surface elsewhere, unless otherwise indicated.

D. Install precast concrete manhole sections with gaskets according to ASTM C 891.

E. Construct cast-in-place manholes as indicated.

F. Install fiberglass manholes according to manufacturer's written instructions.

3.8 CATCH-BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.9 STORM DRAINAGE INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipators at outlets, as indicated.

3.10 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.11 UNDERGROUND DETENTION SYSTEM

A. Connection of the underground storage system to accept storm water run off shall not begin until upstream water quaility has been installed to prevent debris from entering the system.

B. Excavate to subgrade for required storage capacity.

C. Compact and proof roll subgrade of detention system to 95% or as required by system manufacturer.

D. Install fabric and clean stone as required and recommended by the manufacturer to provided the storage volumes as required.

E. Install stone backfill per the manufacturer recommendations. Do not exceed the load limit recommendations of the manufacturer for vehicles, material storageor use of any equipment over the system.

F. Provide inspection portals and access points to the system as shown on the drawings.

G. Chamber system shall be installed within the footprint as shown on the drawings using.

H. Once chamber has been installed the area above shall be protected with additional layer of geotextile fabrics and stione cover to provide live load protection during construction.

3.12 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).

C. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN100 to DN500). Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).

D. Make branch connections from side into existing piping, NPS 21 (DN525) or larger, or to underground structures by cutting opening into existing unit large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.

1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi (20.7 MPa), unless otherwise indicated.
2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.18 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch- (200-mm-) thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Structures: Excavate around structure as required and use one procedure below:

1. Remove structure and close open ends of remaining piping.
2. Remove top of structure down to at least 36 inches (1000 mm) below final grade. Fill to within 12 inches (300 mm) of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
3. Backfill to grade according to Specification Section "Earthwork."

3.19 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plug in end of incomplete piping at end of day and when work stops.
3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate reports for each test.

END OF SECTION 334100

SECTION 334111 - SITE STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Storm drainage piping, fittings, and accessories.

B. Connection of drainage system to municipal sewers.

C. Catch basins, Plant area drains, Paved area drainage, Site surface drainage, Detention tank, and Detention basin.

1.02 RELATED REQUIREMENTS

A. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for additional unit price requirements.

1.04 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.05 REFERENCE STANDARDS

A. ASTM A 74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2006.

B. ASTM C 14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe; 2007.

C. ASTM C 14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe [Metric]; 2007.

D. ASTM C 76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2008.

E. ASTM C 76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe [Metric]; 2008a.

F. ASTM C 443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2005a.

G. ASTM C 443M - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric); 2007.

H. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2003a.

I. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2006.

J. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2008.

K. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2003.

L. ASTM D 2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; 2005.

M. ASTM D 3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2006.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Project Record Documents:
   1. Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the Work of this section.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Cast Iron Soil Pipe: ASTM A 74, Extra Heavy grade, inside nominal diameter as shown on plans, hub and spigot end.

B. Cast Iron Pipe Joint Device: ASTM C 564, rubber gasket joint devices.

C. Concrete Pipe: Reinforced, ASTM C 76 (ASTM C 76M), Class III with Wall type A; mesh reinforcement; inside nominal diameter as shown on plans, bell and spigot end joints.

D. Reinforced Concrete Pipe Joint Device: ASTM C 443 (ASTM C 443M) rubber compression gasket joint.

2.02 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

C. Filter Fabric: Non-biodegradable, woven.

D. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Storm Sewer Service " in large letters.

2.03 CATCH BASIN, CLEANOUT, AND AREA DRAIN COMPONENTS

A. Lids and Drain Covers: Cast iron, hinged to cast iron frame. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
   1. Catch Basin:
      a. Lid Design: Per Details on plans.
   2. Cleanout:
      a. Lid Design: Per Details on plans.
   3. Area Drain:
      a. Lid Design: Per Details on plans.

B. Shaft Construction and Concentric Cone Top Section: Reinforced precast concrete pipe sections, lipped male/female dry joints, nominal shaft diameter of as required for construction.

2.04 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 312316.13.

B. Cover: As specified in Section 312316.13.

PART 3 EXECUTION

3.01 TRENCHING

A. See Section 312316.13 for additional requirements.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION - PIPE

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
   1. Plastic Pipe: Also comply with ASTM D 2321.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Connect to building storm drainage system, foundation drainage system, and utility/municipal sewer system.

E. Install continuous trace wire 6 inches above top of pipe; coordinate with Section 312316.13.

3.03 INSTALLATION - CATCH BASINS AND CLEANOUTS

A. Installation of precast catch basins preferred.

B. Form bottom of excavation clean and smooth to correct elevation.

C. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.

D. Establish elevations and pipe inverts for inlets and outlets as indicated.

E. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 014000.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
   1. Pressure Test: Test in accordance with authorities having jurisdiction.
   2. Infiltration Test: Test in accordance with authorities having jurisdiction.
   3. Deflection Test: Test in accordance with authorities having jurisdiction.

3.05 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 334600 - SUBDRAINAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building Perimeter, Retaining Wall, and Under-Slab Drainage Systems.

B. Filter aggregate and fabric and bedding.

1.02 RELATED REQUIREMENTS

A. Section 312316 - Excavation: Excavating for subdrainage system piping and surrounding filter aggregate.

B. Section 312323 - Fill: Backfilling over filter aggregate, up to subgrade elevation.

C. Section 312316.13 - Trenching: Excavating and backfilling for site subdrainage systems.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for additional unit price requirements.

1.04 REFERENCE STANDARDS

A. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2003.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe drainage products and pipe accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the work of this section.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

A. Manufacturers:

1. Substitutions: See Section 016000 - Product Requirements.

B. Polyvinyl Chloride Pipe: ASTM D 2729; plain end, 4 inch inside diameter; with required fittings.

C. Corrugated Plastic Tubing: Flexible type; 4 inch diameter, with required fittings.

D. Use perforated pipe at subdrainage system; unperforated through sleeved walls.

2.02 AGGREGATE AND BEDDING

A. Filter Aggregate and Bedding Material: Granular fill as specified in Section 312323.

2.03 ACCESSORIES

A. Pipe Couplings: Solid plastic.

B. Filter Fabric: Water pervious type, black polyolefin.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout Drawings.

3.02 PREPARATION

A. Remove large stones or other hard matter that could damage drainage piping or impede consistent backfilling or compaction.

3.03 INSTALLATION

A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions.

B. Place drainage pipe on clean cut subsoil.

C. Lay pipe to slope gradients noted on Drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Place pipe with perforations facing down. Mechanically join pipe ends.

E. Install pipe couplings.

F. Install filter aggregate at sides, over joint covers and top of pipe. Provide top cover compacted thickness of 12 inches.

G. Place filter fabric over levelled top surface of aggregate cover prior to subsequent backfilling operations.

H. Place aggregate in maximum 4 inch lifts, consolidating each lift.

I. Refer to Section 312323 for compaction requirements. Do not displace or damage pipe when compacting.

J. Place impervious fill over drainage pipe aggregate cover and compact.

K. Coordinate the Work with connection to municipal sewer utility service, and trenching.

3.04 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspection and testing.

3.05 PROTECTION

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.

END OF SECTION

INDEX TO DRAWINGS

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

70 LEGRANDE SCHOOL RD, HORSE CAVE, KY 42749

BG# 23-277

SCB PROJECT NUMBER: 2210

CONSTRUCTION DOCUMENTS

AUG 3, 2023

OWNER:

HART COUNTY BOARD OF EDUCATION

25 QUALITY STREET
MUNFORDVILLE, KY 42765

SPECIAL INSPECTIONS PER CHAPTER 17 OF THE KY. BUILDING CODE
(REFER TO STRUCTURAL)

STRUCTURAL DESIGN LOADS
(REFER TO STRUCTURAL)

SEISMIC DESIGN CRITERIA
(REFER TO STRUCTURAL)

CODE INFORMATION

CODE	KENTUCKY BUILDING CODE 2018, THIRD EDITION
USE GROUP (EXISTING)	EDUCATION GROUP E (UNCHANGED)
CONST. TYPE	II B (UNPROTECTED, NON COMBUSTIBLE)
FIRE PROTECTION:	FULLY SPRINKLERED PER NFPA 13
EXISTING AREA:	29,509 SF
ADDITION AREA:	5,647 SF
EXISTING HEIGHT:	1 STORY WITH PARTIAL BASEMENT
ADDITION HEIGHT:	19' +/-

BUILDING HEIGHT AND AREA CALCULATION

ALLOWABLE HEIGHT PER TABLE 504	3 STORIES / 75'0"
ACTUAL HEIGHT	1 STORY / 26'0" +/-
ALLOWABLE AREA: PER TABLE 506.2	43,500 SF PER FLOOR
ACTUAL AREA (EXISTING AND ADDITION)	35,156 SF

ASSEMBLY AREAS OCCUPANT LOAD CALCULATIONS

CAFETERIA: EGRESS PROVIDED 216 INCHES / .15 = 1,440 MAX. OCCUPANTS
DINING AREA = 1/15 SF- 2,700 / 15 = 180
TOTAL SEATING FOR CAFETERIA = 180

SHERMAN CARTER BARNHART ARCHITECTS, PLLC
JENNIFER CASH, PROJECT MANAGER

144 TURNER COMMONS WAY
SUITE 110
LEXINGTON, KY 40508
PHONE: 859.224.1351

www.scbarchitects.com

CIVIL ENGINEER

SHERMAN CARTER BARNHART ARCHITECTS, PLLC
144 TURNER COMMONS WAY, SUITE 110
LEXINGTON, KY 40504
P (859) 224-1351

MECHANICAL/ELECTRICAL ENGINEER

CMTA CONSULTING ENGINEERING
16411 MEETING STREET
PROSPECT, KY 40059
P (502) 326-3085

STRUCTURAL ENGINEER

POAGE ENGINEERS
880 SPARTA COURT, SUITE 200
LEXINGTON, KY 40504
P (859) 255-9034

SCB PROJECT NO. 2210

2210
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/4/2023 2:38:11 PM

J. LEFTWICH PLS 2013

NAD 83 KY SINGLE ZONE

Zone A – Areas subject to inundation by the 1% annual chance flood event. No Base Flood Elevations (BFEs) or flood depths are shown.

PVA MAP NO. 087-00-00-071.00
EUELL D. & BETTY SUE GAMMONS
DEED BOOK 163 PAGE 109

PVA MAP NO. 087-00-00-070.00
HART CO SCHOOL DISTRICT FINANCE CORP.

LeGrande Elemntary School
1 Story Building

CP #101 Iron Pin and Cap marked "Qk4 CONTROL"
NORTHING= 3585649.89
EASTING= 4908117.67
ELEVATION=648.17

CP #102 Iron Pin and Cap marked "Qk4 CONTROL"
NORTHING= 3586043.99
EASTING= 4908327.56
ELEVATION=650.52

CP #103 Iron Pin and Cap marked "Qk4 CONTROL"
NORTHING= 3586149.37
EASTING= 4907959.41
ELEVATION=648.66

CP #104 Iron Pin and Cap marked "Qk4 CONTROL"
NORTHING= 3585736.97
EASTING= 4907861.53
ELEVATION=646.32

LEGRANDE HIGHWAY
60' R/W
(KYTC R/W Plans 1928)

GRAPHIC SCALE IN FEET
20 10 0 20

VICINITY MAP
NOT TO SCALE
LAT.: 37°10'16.30" N
LONG.: 85°47'42.56 W
HART COUNTY, KENTUCKY

CONTROL

SITE CONTROL:
Survey Control for this survey was established by redundant GPS observation established on April 8, 2022. The horizontal coordinates for this survey are based on NAD83, Kentucky Single Zone, US Survey Feet. With reference to NAVD88 (Geoid18B)

CP #101 Iron Pin and Cap marked "Qk4 CONTROL"
NORTHING= 3585649.89
EASTING= 4908117.67
ELEVATION=648.17

CP #102 Iron Pin and Cap marked "Qk4 CONTROL"
NORTHING= 3586043.99
EASTING= 4908327.56
ELEVATION=650.52

CP #103 Iron Pin and Cap marked "Qk4 CONTROL"
NORTHING= 3586149.37
EASTING= 4907959.41
ELEVATION=648.66

CP #104 Iron Pin and Cap marked "Qk4 CONTROL"
NORTHING= 3585736.97
EASTING= 4907861.53
ELEVATION=646.32

NOTES

The bearing datum for this survey plat is based on NAD 83, Kentucky State Plane Coordinates, Single Zone, US Survey Feet.

Real Time Kinematics "RTK" survey methods were used to obtain coordinate values for this entire survey using Trimble R12i GNSS multi-frequency receivers. Control is based on redundant GPS observations tied to horizontal and vertical datum on the date of field observation April 8, 2022.

The subject Property shown hereon does not lie within a flood hazard zone as indicated by Flood Rate Insurance Rate Map 21099C0300C, dated 07/18/2011.

Utility locations were surveyed on site on the date of the field survey. The location of utilities hereon are based on a KY811 Utility Locate Request, observed evidence, available plans, and utilizing a Ground Penetrating Radar (GSSI 400 MHZ SIR 4000), and a utility line locator (Rigid SR50 and ST-33QR TX). QK4 follows ASCE Utility Location Standards for SUE Level B requirements. SUE Level B results can be repeated, but lacking excavation, the exact location of the underground feature cannot be accurately, completely, and reliably depicted. Other utilities may exist and not be shown.

This survey complies with 201 KAR 18:150 Standards of Practice for Professional Land Surveyors in Kentucky. THIS IS NOT A BOUNDARY SURVEY. Not to be recorded or used for the transfer of real property. Lot lines are shown for indexing purposes only and should not be construed to be true and accurate. Record document not found for subject property. Presumed destroyed when the courthouse caught fire in 1928. Held occupations lines for boundary which match tax documents.

LEGEND

- Sanitary Manhole
- Control
- Electrical Junction Box
- Flag Pole
- Pipe (Noted)
- Utility Pole
- Irrigation
- Tree (Deciduous)
- Property Corner
- Water Valve
- Satellite Dish
- Grease Trap
- Downspout
- Fire Hydrant
- Misc. (Noted)
- Gas Line Marker
- Light Pole
- Communication Pedestal
- Bollard
- Water Meter
- AC Units
- Sanitary Cleanout
- Property Boundary
- R/W Line
- Gas
- UG Electric
- Water
- Flow Line
- UG Telephone
- Tree Line
- Road ℄
- Guardrail
- Storm Line
- San. Sewer Line

CERTIFICATION

I certify that the topographic survey shown hereon and the topographic measurements annotated on this plat are true and correct to the best of my ability and belief. No effort was put to locate the property boundary or certify the measurements as relate to the property boundary of this parcel or adjoining lands. This survey does not comply with the regulations for a boundary survey under 201 KAR 18:150.

Robert Neuhaus, PLS # 3857 — 04/14/2022 Date

STATE OF KENTUCKY
ROBERT NEUHAUS
3857
LICENSED LAND SURVEYOR

Qk4 Project: 22543– LeGrande Elementary School

THIS SURVEY PREPARED FOR:

LEGRANDE ELEMENTARY SCHOOL–HART COUNTY
70 LEGRANDE SCHOOL ROAD
HORSE CAVE, KY 42749

PLANNING
SURVEY
ENGINEERING

QK4 INC. LAND SURVEY
1046 EAST CHESTNUT STREET
LOUISVILLE, KY 40204
(502) 585–2222

GENERAL PHASING NOTES:

1. IN ALL PHASES OF THIS JOB, THE CONTRACTOR MUST FULLY COOPERATE WITH THE OWNER CLOSELY TO COORDINATE ACCESS TO THE SITE, MATERIAL STORAGE AND STAGING AREAS, INTERRUPTIONS OF UTILITIES, MAINTENANCE OF MEANS OF EGRESS AND SIMILAR ITEMS NECESSARY FOR THE OWNER'S SAFE OPERATION AND USE OF PREMISES DURING CONSTRUCTION.
2. THE CONTRACTOR SHALL PROVIDE TEMPORARY UTILITIES AS REQUIRED DURING CONSTRUCTION. SHOULD ABUSE OF TEMPORARY UTILITIES BE NOTED BY THE OWNER AND ARCHITECT, THE GENERAL CONTRACTOR SHALL BE CHARGED ACCORDINGLY. ADDITIONAL OFF SITE UTILITIES THAT MAY BE REQUIRED SUCH AS PROPANE GAS OR ADDITIONAL ELECTRIC METER SERVICE SHALL BE PROVIDED BY THE CONTRACTOR. SHOULD CONTRACTOR DISCONNECT ANY EXISTING UTILITIES FROM A PORTION OR PORTIONS OF THE BUILDING DURING CONSTRUCTION AND REQUIRE ADDITIONAL UTILITIES TO BE PROVIDED FOR TEMPORARY HEAT, LIGHTING, ETC., THIS COST SHALL BE BORNE BY THE CONTRACTOR.
3. THE CONTRACTOR SHALL INSTALL TEMPORARY ENCLOSURES, DUST BARRIERS, AND EGRESS DOORS AS REQUIRED FOR CONTROL OF SOUND, DUST AND SEPARATION OF STUDENT POPULATION FROM CONSTRUCTION AREAS. THE CONTRACTOR SHALL REFER TO SPECIFICATIONS FOR ADDITIONAL SAFETY MEASURES AND TEMPORARY ENCLOSURES.
4. THE CONTRACTOR SHALL NOTIFY THE OWNER TWO (2) WEEKS PRIOR TO ANY ANTICIPATED UTILITY OUTAGES.
5. ALL WORK TO BE COMPLETED WITHIN AREAS OF THE BUILDING THAT ARE TO REMAIN OPEN SHALL BE COORDINATED WITH THE OWNER AND BUILDING OCCUPANTS.
6. THE MEANS OF EGRESS MUST BE MAINTAINED FROM ALL OCCUPIED PORTIONS OF THE FACILITY AT ALL TIMES TO THE SATISFACTION OF THE LOCAL BUILDING CODE ENFORCEMENT OFFICIALS AND THE OWNER.
7. MINOR DEMOLITION AND RENOVATION MAY NOT OCCUR IN AN OCCUPIED AREA DURING OPERATING HOURS, BUT MAY OCCUR AFTER HOURS AND DURING UNOCCUPIED HOURS. SUCH WORK MUST BE SCHEDULED WITH THE OWNER A MIN. OF (2) WEEKS IN ADVANCE .
8. INTERRUPTION OF ANY OF THE BUILDING UTILITIES MAY ONLY OCCUR AFTER HOURS, DURING UNOCCUPIED PERIODS OR DURING HOLIDAYS OR SCHEDULED VACATIONS. FULL SERVICE MUST BE RESTORED TO OCCUPIED AREAS OF THE FACILITY PRIOR TO RE-OCCUPANCY.
9. NO CONDITIONS WILL BE PERMITTED WHICH, IN THE OPINION, OF THE OWNER, CODE OFFICIAL, OR THE ARCHITECT CONSTITUTES AN UNSAFE CONDITION OR HAZARD TO THE OCCUPANTS OR CONTINUE USE OF THE FACILITY.
10. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN ALL SIGNAGE AND TRAFFIC CONTROL DEVICES REQUIRED THROUGH AND AROUND THE SITE. COORDINATE WITH THE OWNER.
11. CONTRACTOR IS RESPONSIBLE FOR KEEPING THE SITE SECURE AND SAFE AT ALL TIMES.
12. TEMPORARY PEDESTRIAN ROUTES SHALL BE ADA ACCESSIBLE.
13. ALL EXISTING DRIVES SHALL REMAIN OPEN WHILE SCHOOL IS IN SESSION.

THE CONTRACTOR SHALL PREPARE A DETAILED SITE LOGISTICS AND PHASING PLAN FOR OWNER APPROVAL SHOWING SCHEDULED CONSTRUCTION ACTIVITIES AND FENCING OF AREAS TO ACHIEVE GOALS OF THE LOGISTICS PLAN.

SCALE: 1" = 20'-0" SCALE IN FEET 0 10 20 60

LEGEND

- PROPERTY LINE (LIMITS OF DEMOLITION)
- LIMITS OF CONSTRUCTION
- T — TREE PROTECTION FENCE REFER TO DETAIL A / DS-100
- CONTRACTOR SHALL REMOVE EXISTING ASPHALT AND STONE BASE COMPLETELY. UNDERCUT SUBGRADE MATERIAL AS REQUIRED TO CONSTRUCT NEW ASPHALT SECTION. TOP ON NEW ASPHALT SHALL BE FLUSH WITH TOP OF ADJACENT EXISTING ASPHALT.
- REMOVE/RELOCATE - DISPOSE OF OFF-SITE AT AN APPROVED LOCATION OR FACILITY

JOB SITE SAFETY

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR JOB SITE SAFETY DURING CONSTRUCTION. JOB SITE SAFETY IS OUTSIDE THE SCOPE OF WORK OF SHERMAN CARTER BARNHART (SCB). NEITHER THE PROFESSIONAL ACTIVITIES OR THE PRESENCE OF SCB EMPLOYEES OR SUBCONSULTANTS AT THE CONSTRUCTION SITE SHALL RELIEVE THE CONTRACTOR OR ANY OTHER ENTITY OF THEIR OBLIGATION, DUTIES, AND RESPONSIBILITIES INCLUDED, BUT NOT LIMITED TO, CONSTRUCTION MEANS, METHODS, SEQUENCES, TECHNIQUES, TO PROCEDURES NECESSARY FOR PERFORMING SUPERINTENDING OR COORDINATING ALL PORTIONS OF THE WORK OF CONSTRUCTION IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND ANY HEALTH AND SAFETY PRECAUTIONS REQUIRED BY GOOD CONSTRUCTION PRACTICES OR ANY REGULATORY AGENCIES. ANYONE USING INFORMATION FROM THESE PLANS ACKNOWLEDGES AND WARRANTS THAT SHERMAN CARTER BARNHART IS NOT RESPONSIBLE FOR SITE SAFETY IN ANY WAY.

GENERAL DEMOLITION NOTES:

1. SITE DEMOLITION DRAWINGS ARE INTENDED TO GENERALLY SHOW THE DEMOLITION NECESSARY TO COMPLETE THE NEW WORK. THE CONTRACTOR SHALL REVIEW ALL DOCUMENTS AND VISIT AND OBSERVE THE SITE PRIOR TO SUBMITTING HIS BID AND SHALL INCLUDE IN HIS BID ALL WORK NECESSARY TO ACCOMPLISH THE NEW WORK, WHETHER OR NOT SHOWN ON THESE DEMOLITION DRAWINGS.
2. ALL TREES ARE TO REMAIN UNLESS SPECIFICALLY NOTED OTHERWISE.
3. REFER TO SITE UTILITY PLANS FOR DEMOLITION AND/OR RELOCATION OF UTILITIES.
4. FOR CONCRETE REMOVAL, REMOVE TO THE NEAREST CONSTRUCTION JOINT. PROVIDE A CLEAN SAW CUT JOINT TO ALL EXISTING EDGES OF CONCRETE TO REMAIN.
5. ALL DEMOLISHED MATERIALS NOT SPECIFICALLY NOTED TO BE RETURNED TO OWNER, ARE TO BE PROPERLY DISPOSED OF OFFSITE.
6. ALL FOUND MEMORIAL MONUMENTS SHALL BE SALVAGED AND RETURNED TO OWNER.
7. ALL EXISTING SITE FURNISHINGS AND TRASH RECEPTACLES, WITHIN DEMOLITION AREAS, SHALL BE SALVAGED AND RETURNED TO OWNER.
8. WHERE STORM DEMOLITION OCCURS WITHIN FOOTPRINT OF NEW BUILDING ADDITIONS AND NEW PAVEMENT AREAS, CONTRACTOR SHALL BACKFILL TRENCHES WITH COMPACTED DGA.

UTILITIES

THE UTILITIES ARE SHOWN ON THE DRAWINGS AS ACCURATELY AS THEY HAVE BEEN PROVIDED TO THE ARCHITECT. THEIR LOCATIONS ARE NOT GUARANTEED. IT IS THE CONTRACTORS RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES AND TO HAVE ALL UTILITIES FIELD LOCATED, PRIOR TO STARTING CONSTRUCTION. THE UTILITIES SHOWN REPRESENT OBSERVABLE FEATURES ALONG WITH INFORMATION PROVIDED BY THE RESPECTIVE UTILITY COMPANIES, AND IS THEREFORE NOT WARRANTED. PRIOR TO CONSTRUCTION THE CONTRACTOR IS TO FIELD VERIFY ALL UTILITY LOCATIONS, SIZES, TYPE ETC. NEEDED TO COMPLETE THE WORK OF THE CONTRACT.

THE CONTRACTOR SHALL NOTIFY THE ARCHITECT IF A CONFLICT IS ANTICIPATED. IF THE CONTRACTOR PROCEEDS WITHOUT CONTACTING THE UTILITY COMPANIES AND DOES NOT NOTIFY THE ARCHITECT OF POTENTIAL CONFLICTS HE DOES SO AT HIS OWN RISK.

SITE DEMOLITION KEY

1. EXISTING PAVING AND GRAVEL SUB-BASE TO BE REMOVED COMPLETELY. COORDINATE LIMITS WITH SITE DEVELOPMENT AND SITE UTILITY DRAWINGS.
2. (NA) ~~EXISTING TREE OR SHRUB AND ROOT SYSTEM TO BE REMOVED COMPLETELY.~~
3. (NA) ~~SAW CUT TO PROVIDE CLEAN EDGE. COORDINATE EXACT LOCATIONS WITH SITE DEVELOPMENT AND SITE UTILITY DWGS.~~
4. EXISTING CONCRETE FOUNDATIONS TO BE REMOVED COMPLETELY.
5. EXISTING FENCING TO BE REMOVED COMPLETELY.
6. EXISTING UTILITY TO BE REMOVED COMPLETELY.

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY DAVID MICHAEL DIAZ 1021 REGISTERED LANDSCAPE ARCHITECT

LEGRANDE ELEMENTARY ADDITION AND RENOVATIONON

HART COUNTY BOARD OF EDUCATION
70 LeGRANDE SCHOOL ROAD
HORSE CAVE, KENTUCKY 42749

DEMOLITION PLAN

JOB NO.	2210
DATE	August 3,2023
DRAWN	DMD
CHECKED	

REVISIONS

No.	Description	Date

SHEET

DS1.0

X:\Projects\2022\2210_CORE\Site\2210 SD1X.dwg
Day & Time: Aug 02, 2023 - 5:30pm
Login Name: ddiaz
Sheet Layout: MODEL

SITE DETAILS KEY

KEY	DESCRIPTION	DETAIL
A	HEAVY DUTY ASPHALT PAVEMENT	AP / SD-3.0
B	CONCRETE PAVING	CP / SD-3.0
C	NOT USED	
D	CONCRETE WALK	CW / SD-3.0
E	1/2" EXPANSION JOINT MATERIAL W/ SEALANT (TYP.)	EJ / SD-3.0
F	1/4" TOOLED CONTROL JOINT (TYP.)	TJ / SD-3.0
G	4" WIDE WHITE PAINT STRIPE (TYP.)	SEE SPECS.
H	PIPE BOLLARD	BD / SD-3.0
I	SITE UTILITY	SEE MECH/ELEC
J	CONCRETE WALK WITH TURNED DOWN EDGE	TW / SD-3.0
K	4'-0" TALL, PVC COATED, CHAINLINK FENCE AND SINGLE GATE	CF / SD-3.0
L	8'-0" TALL CHAINLINK FENCE, PVC COATED	CF / SD-3.0
M	8'-0" TALL CHAIN LINK FENCE DOUBLE VEHICULAR GATE, PVC COATED	CF / SD-3.0
N	8'-0" TALL CHAIN LINK FENCE SINGLE GATE, PVC COATED,	CF / SD-3.0
O	8'-0" TALL CHAINLINK FENCE, PVC COATED, WITH PVC SLATS	CF / SD-3.0
P	8'-0" TALL CHAIN LINK FENCE DOUBLE VEHICULAR GATE, PVC COATED, WITH PVC SLATS	CF / SD-3.0
Q	8'-0" TALL CHAIN LINK FENCE SINGLE GATE, PVC COATED, WITH PVC SLATS	CF / SD-3.0
R	CONCRETE RAMP	HD / SD-3.1
S	HANDRAIL	HD / SD-3.1
T	GUARDRAIL	GR / SD-3.1
U	CONCRETE STEPS	SD / SD-3.0
V	CHEEK WALLS AT CONCRETE STEPS (SEE STRUCTURAL)	K / S-3.1
W	TERRACE WALL (SEE STRUCTURAL)	D / S-3.1
X	TERRACE WALL AT CONCRETE STEPS (SEE STRUCTURAL)	P / S-3.1

GENERAL SITE NOTES:

1. PROVIDE 1/2" EXP. JT. MATERIAL W / SEALANT WHERE NEW CONC. CURBS, WALKS, OR PAVING ABUT STORM SEWER STRUCTURES, BUILDINGS, ETC.
2. AT END OF PROJECT, CONTRACTOR SHALL REMOVE ALL TEMPORARY FENCING, TEMPORARY EROSION CONTROL STRUCTURES, AND OTHER TEMPORARY SERVICES ON SITE.
3. ALL RADII ARE TO BE 5' UNLESS SHOWN OTHERWISE.
4. CONSTRUCTION SHALL BE IN ACCORDANCE WITH ALL LOCAL, STATE, FEDERAL GOVERNING AGENCIES.
5. ALL PERMITS AND BONDS ARE THE RESPONSIBILITY OF THE CONTRACTOR.
6. ANY AREAS DAMAGED SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE TO THE SATISFACTION OF THE OWNER. ALL GRASS AREAS DISTURBED DURING CONSTRUCTION SHALL BE SEEDED UNLESS OTHERWISE SHOWN TO RECEIVE SOD.
7. UTILITIES ON THIS SHEET ARE FOR REFERENCE ONLY, REFER TO UTILITY DRAWINGS FOR LOCATIONS. UNLESS OTHERWISE SHOWN ON THIS SHEET.
8. ALL DIMENSIONS ARE TO THE FACE OF CURB UNLESS SHOWN OTHERWISE.
9. ALL TREES ARE TO REMAIN UNLESS SPECIFICALLY NOTED OTHERWISE.
10. CONTRACTOR TO COORDINATE STAGING, CONSTRUCTION ENTRANCE, AND NEW WORK WITH OWNER.
11. REFER TO MECH/ELEC/PLUM SITE UTILITY SHEETS FOR ADDITIONAL CUT AND PATCHING OF PAVEMENTS.
12. REFER TO STRUCTURAL AND ARCHITECTURAL DRAWINGS FOR CONCRETE WALK CONNECTION TO BUILDING SLAB AT DOORWAYS.
13. CAD FILES WILL BE AVAILABLE TO SUCCESSFUL CONTRACTOR FOR LAYOUT PURPOSES UPON CONTRACTOR SIGNING OF RELEASE FORM. ANY ADDITIONAL DIMENSIONS REQUIRED FOR LAYOUT SHALL BE REQUESTED BY THE CONTRACTOR.
14. WHERE NEW WORK OCCURS IN EXISTING PAVEMENT, CONTRACTOR SHALL CUT AND PATCH PAVEMENT AS REQUIRED TO COMPLETE NEW WORK AND RESTORE PAVEMENT. MATCH PAVEMENT TYPE. SEE SPECIFIC DETAILS FOR NEW PAVEMENT SECTIONS. IF SPECIFIC DETAIL IS NOT INCLUDED CONTRACTOR SHALL MATCH EXISTING PAVEMENT SECTION. FOR ASPHALT PATCHING SEE DETAIL EK/SD3.1 FOR EDGE KEY. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING WITH ALL DRAWINGS INCLUDING ALL SITE UTILITY DRAWINGS AND ASSOCIATED UTILITY TRENCHING
15. ALL LIGHT STANDARDS SHALL BE EQUIDISTANT FROM BACK OF CURB UNLESS NOTED OTHERWISE (TYP. 3 FEET CLEAR BETWEEN BACK OF CURB AND FACE OF FIXTURE FOUNDATION). WHERE LIGHT STANDARDS ARE SHOWN IN LINE, INTENT IS FOR THE POLES TO ALIGN WITHIN A 1" TOLERANCE. REFER TO SITE ELECTRICAL SHEET FOR FURTHER INFORMATION.
16. COORDINATES SHOWN ON THIS DRAWING ARE PROVIDED TO LOCATE NEW BUILDING ON SITE. CONTRACTOR SHALL REFER TO ARCHITECTURAL DRAWINGS FOR ACTUAL BUILDING DIMENSIONS.

LEGEND

- PROPERTY LINE (LIMITS OFCONSTRUCTION)
- T — TREE PROTECTION FENCE REFER TO DETAIL A / DS-1.0
- CONCRETE WALK - CW / AS-201

KEY TO SHADING

- HEAVY DUTY ASPHALT PAVEMENT
- CONCRETE PAVING

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
DAVID MICHAEL DIAZ
1021
REGISTERED LANDSCAPE ARCHITECT

LEGRANDE ELEMENTARY ADDITION AND RENOVATIONON

HART COUNTY BOARD OF EDUCATION
70 LeGRANDE SCHOOL ROAD
HORSE CAVE, KENTUCKY 42749

SITE DEVELOPMENT PLAN

JOB NO.	2210
DATE	August 3,2023
DRAWN	DMD
CHECKED	

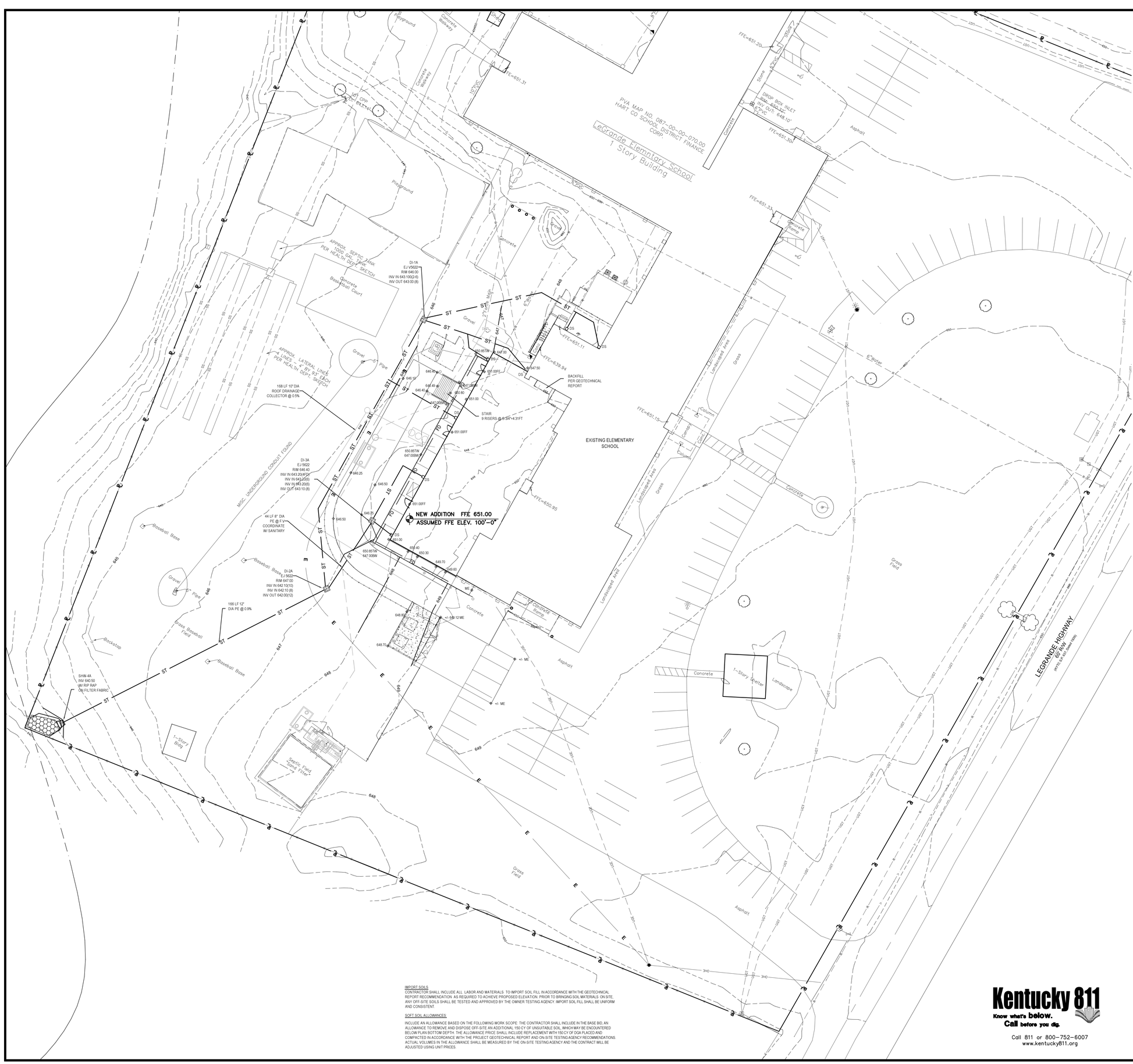
REVISIONS

No.	Description	Date

SHEET

SD1.0

X:\Projects\2022\2210_CORE\Site\2210 SD1X.dwg
Date & Time: Aug 03, 2023 - 1:32pm
Login Name: ddiaz
Sheet Layout: MODEL



GRADING SITE LEGEND

REFER TO TOPOGRAPHIC SURVEY FOR EXISTING UTILITIES LEGEND

REFER TO SITE DEVELOPMENT PLANS FOR SITE LEGEND

SYMBOLS	DESCRIPTION
500	EXISTING CONTOUR MINOR
500	EXISTING CONTOUR MAJOR
500	CONTOUR MINOR
500	CONTOUR MAJOR
×979.5	EXISTING SPOT ELEVATION
979.55	SPOT ELEVATION (AT GUTTER LINE ADD 6" FOR TOP OF CURB ELEVATION)
979.55 FL	CHANNEL FLOW LINE ELEVATION
979.55 HP	SPOT ELEVATION HIGH POINT @ BREAKLINE
979.55 TC	SPOT ELEVATION TOP OF CURB/CONCRETE
979.55 GL	SPOT ELEVATION GUTTER LINE
ME MATCH EXIST	EXISTING FIELD VERIFIED SPOT ELEVATION (AT GUTTER LINE ADD 6" FOR CURB ELEVATION)
979.55 FL	SPOT ELEVATION FLUSH AT GUTTER LINE
979.55 FFE	FINISH FLOOR ELEVATION
979.55 CC	CURB CUT ELEVATION
DI	DROP INLET SQUARE OR ROUND DI/SD4.0
SHW	STANDARD HEADWALL SHW/SD4.0
DS EDS	NEW OR EXISTING DOWNSPOUTS ARE SHOWN FOR REFERENCE ONLY REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATION PROVIDE BOOTS PER(DS/SD4.0)
FD	4" DIA FOUNDATION DRAIN SMOOTH INTERIOR FDS/D4.0
ST	STORM SEWER ST/SD4.0
1.0 %	GRADE/SLOPE
	RUNOFF FLOW ARROW
	HANDICAPPED RAMP MAX SLOPE 8.33%
F.V.	FIELD VERIFY EXISTING CONDITIONS AND ADJUST ACCORDINGLY

GRADING AND DRAINAGE NOTES:

1. ALL EARTHWORK FOR THIS PROJECT SHALL BE UNCLASSIFIED EXCAVATION TO PLAN BOTTOM DEPTH. PLAN BOTTOM DEPTH IS DEFINED AS THE LOWEST ELEVATION OF EXCAVATION. THIS INCLUDES BOTTOM OF EXCAVATION FOR FOUNDATIONS, UTILITIES, ROADS, PARKING, SIDEWALKS, REQUIRED UNSUITABLE SOILS UNDERCUTTING AND/OR ROCK REMOVAL AS INDICATED OR NOTED ON DRAWINGS OR GEOTECHNICAL REPORT.

2. AREAS THAT WILL SUPPORT FOUNDATIONS, FLOORS, PAVEMENTS, SHALL BE PROPERLY PREPARED AS SPECIFIED IN ACCORDANCE WITH GEOTECHNICAL EXPLORATION REPORT PREPARED B Y SOLID GROUND CONSULTING ENGINEERS PLLC DATED AUGUST 2023 AND SHALL BE APPROVED BY ON-SITE THE GEOTECHNICAL ENGINEER/TESTING AGENCY.

3. PRIOR TO CONSTRUCTION OR THE PLACEMENT OF NEW ENGINEERED FILL, THE EXPOSED SUBGRADE SHALL BE EVALUATED BY THE ON-SITE GEOTECHNICAL ENGINEER. THE EVALUATION SHALL INCLUDE PROOFROLLING OF THE EXPOSED SUBGRADE. IF UNSUITABLE MATERIALS AREA DISCOVERED, AN APPROPRIATE REMEDIAL MEASURE WOULD BE RECOMMENDED BY THE GEOTECHNICAL ENGINEER AT THAT TIME.

4. CARE MUST BE EXERCISED DURING GRADING AND FILL PLACEMENT OPERATIONS. THE COMBINATION OF CONSTRUCTION EQUIPMENT TRAFFIC AND EXCESS SURFACE MOISTURE CAN CAUSE PUMPING AND DETERIORATION OF THE NEAR SURFACE SOILS. THE SEVERITY OF THIS POTENTIAL PROBLEM DEPENDS TO A GREAT EXTENT ON THE WEATHER CONDITIONS PREVAILING DURING CONSTRUCTION. THE CONTRACTOR MUST EXERCISE DISCRETION WHEN SELECTING EQUIPMENT SIZES AND ALSO MAKE A CONCERTED EFFORT TO CONTROL SURFACE WATER WHILE THE SUBGRADE SOILS ARE EXPOSED. IF SUCH PROBLEMS DO ARISE, THE GEOTECHNICAL ENGINEER SHOULD BE CONTACTED TO EVALUATE THE CONDITION.

5. ENGINEERED FILL PLACEMENT AND COMPACTION OPERATIONS SHALL BE MONITORED BY THE GEOTECHNICAL ENGINEER OR HIS REPRESENTATIVE. FIELD DENSITY TESTS MUST BE PERFORMED ON EACH LIFT AS NECESSARY TO CHECK THAT THE SPECIFIED COMPACTION IS BEING ACHEVED

6. THE CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING STORM SEWER, STRUCTURES, PIPES, AND ALL OTHER UTILITIES PRIOR TO CONSTRUCTION, AND, SHALL CLOSELY MONITOR UTILITY INSTALLATION BY OTHERS. IT IS RECOMMENDED TO INSTALL GRAVITY STORM AND SANITARY LINES PRIOR TO ELECTRICAL, COMMUNICATION AND WATER LINES. BURY DEPTH CONFLICTS DUE TO NON COORDINATION WILL NOT SUBJECT TO CHANGE REQUEST.

7. EXCAVATION, ROCK REMOVAL, TOPSOIL STOCKPILES, DETENTION POND BERMS, UTILITY TRENCHES, AND OTHER ASPECTS OF CONSTRUCTION SHALL COMPLY WITH THE REQUIREMENTS OF THE OSHA REGULATIONS 1926.650-652.

8. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE PROJECT CIVIL ENGINEER OF ANY DISCREPANCIES FOUND BETWEEN THESE PLANS AND FIELD CONDITIONS PRIOR TO CONSTRUCTION.

9. THE PRINCIPLES OF POSITIVE DRAINAGE SHALL BE APPLIED UNIVERSALLY ACROSS THE SITE. WATER SHALL BE MOVED AWAY FROM THE BUILDINGS. WATER SHOULD NOT BE ALLOWED TO POND AT LOW POINTS OR IN LOW AREAS. FINISH SUBGRADE TO REQUIRED ELEVATION WITHIN THE FOLLOWING TOLERANCES:

LAWN OR UNPAVED AREAS: PLUS OR MINUS 0.1FT.
SIDEWALKS: PLUS OR MINUS 0.1FT.
PAVEMENT: PLUS OR MINUS 0.05FT.
GRADING INSIDE BUILDING LINE TO A TOLERANCE OF 0.05 FT WHEN TESTED WITH A 10 FOOT STRAIGHTEDGE

10. AFTER COMPLETION OF CONSTRUCTION, THE CONTRACTOR SHALL PERFORM SITE CLEANUP TO REMOVE ALL TRASH, DEBRIS, EXCESS MATERIALS, EQUIPMENT, AND OTHER DELETERIOUS MATERIALS ASSOCIATED WITH CONSTRUCTION. THE SITE CONTRACTOR IS EXPRESSLY RESPONSIBLE FOR ENSURING THE SITE IS CLEAN AND IN OPERABLE CONDITION AT THE TIME OF FINAL ACCEPTANCE.

11. PROPOSED , EXISTING ROAD AND PARKING AREAS ARE NOT DESIGNED TO ACCOMMODATE HIGH LOADS CREATED BY CONSTRUCTION VEHICLES. CONTRACTOR SHALL MAINTAIN, STABILIZE AND REPAIR SUBGRADE/STONE BASE AND EXISTING ASPHALT PAVEMENT DAMAGED BY CONSTRUCTION TRAFFIC AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER. CONTRACTOR IS RESPONSIBLE PROVIDE AND MAINTAIN TEMPORARY CONSTRUCTION ROAD IN ACCORDANCE WITH CONTRACTOR CONSTRUCTION METHOD AND SCHEDULE.

12. IF EXISTING FOUNDATION DRAINS EXIST AT EXISTING FOUNDATIONS. RECONNECT AND EXTEND EXISTING FOUNDATION DRAIN AS REQUIRED TO PROVIDE SUBSURFACE DRAINAGE.

13. ALL VALVE, MITERS AND MANHOLE COVERS SHALL BE ADJUSTED TO MATCH THE NEW GRADES. (TYP)

DRAINAGE STRUCTURE NOTES:

1. ALL LENGTHS OF STORM SEWER PIPING ARE APPROXIMATE. CONTRACTOR SHALL PROVIDE PIPE MATERIALS AND FITTINGS AS NECESSARY TO COMPLETE THE STORM SEWER SYSTEM AS INDICATED OR REQUIRED

2. PROVIDE PIPE SUPPLIED BY PRODUCER THAT IS LISTED ON THE LIST OF APPROVED MATERIALS PUBLISHED BY KENTUCKY TRANSPORTATION CABINET AND IN ACCORDANCE WITH SECTION 815 KTC STANDARD SPECIFICATION FOR ROAD AND BRIDGE CONSTRUCTION EDITION OF 2008. ENSURE ALL FITTINGS AND PIPE ARE MADE FROM THE SAME TYPE OF MATERIAL.
STORM PIPE DESIGNATION
PE THERMOPLASTIC PIPE, PROVIDE "ADS" N-12 IBWT PIPE CORRUGATED HIGH DENSITY POLYETHELENE PIPE (HDPE OR CPEP) WITH SMOOTH INTERIOR WALL W/ WATER-TIGHT JOINTS
OR EQUIVALENT, MEETING AASHTO STANDARD M294. INSTALL AND BACKFILL HDPE PIPE IN STRICT ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

RCP- REINFORCED CONCRETE PIPE CONFORMING AASHTO M-170 CLASS III.

3. ALL PIPES ENTERING STORM SEWER STRUCTURES SHALL BE GROUTED TO ASSURE CONNECTION AT STRUCTURE IS WATER TIGHT.

4. ADJUST ALL SEWER AND DRAIN FRAMES AND GRATES OR COVERS TO FINISH GRADE AND ENSURE THAT GRATES AND FRAMES ARE FIRMLY SEATED ON PIPE.

5. PROVIDE 4000 PSI @ 28 DAYS CONCRETE CEMENT TYPE 1 OR TYPE 2 FOR ALL CONCRETE DRAINAGE STRUCTURES.

6. PLACE PIPE TO THE GRADES AND ALIGNMENT AS SHOWN ON DRAWINGS WITH THE FOLLOWING TOLERANCES.
HORIZONTALLY ± 0.10'
VERTICALLY ± 0.05'

7. PROVIDE CONSISTENT SLOPE TO STORM DRAINAGE STRUCTURES. INTENT IS TO AVOID ABRUPT GRADE CHANGES ADJACENT TO DRAINAGE STRUCTURES. NO SLOPES GREATER THAN 10:1.

ACCESSIBILITY INFORMATION:

1. THE ELEVATION OF ALL EXTERIOR WALKS AND SLABS SHALL BE FLUSH WITH FINISH FLOOR ELEVATION AT ALL DOORS, AND SHALL SLOPE NO MORE THAN 2% WITHIN 5' OF THOSE DOORS. ELSEWHERE EXTERIOR WALKS AND SLABS SHALL CONFORM TO THE SPOT ELEVATIONS AND CONTOURS INDICATED AND IN NO CASE SHALL EXCEED 5% SLOPE EXCEPT AT CURBS RAMPS WHICH SHALL SLOPE 8.33% (MAX.). CROSS SLOPE OF WALKING SURFACES SHALL NOT BE STEEPER THAN 2.0%.

2. GRATING LOCATED WITHIN ROUTE SHALL BE POSITIONED PERPENDICULAR TO DIRECTION OF THE TRAVEL. SLOT WIDTH SHALL NOT EXCEED 1/2" UNLESS OTHERWISE NOTED.

3. PARKING SPACES AND ACCESS AISLES SHALL BE LEVEL WITH SURFACES SLOPES NOT EXCEEDING 2.0% (1:50)

4. TRANSITIONS FROM RAMPS TO WALKS, SHALL BE FLUSH AND FREE OF ABRUPT CHANGES.

5. RAMPS TO BUILDING WHERE INDICATED

a. MINIMUM WIDTH 48" SEE PLAN FOR ACTUAL DIMENSION.
b. SLOPE TO BE 1:12 MAXIMUM TO 1:20
c. CROSS SLOPE 2% MAXIMUM.
d. FLARED SIDES MAXIMUM SLOPE 1:10

SITE UTILITIES NOTES: REFER TO M & E DRAWINGS FOR DEMOLITION AND INSTALLATION OF NEW UTILITIES. SANITARY AND WATER LINES ARE SHOWN FOR COORDINATION ONLY.

1. CONTRACTOR SHALL CALL KENTUCKY 811 AT LEAST 2 BUSINESS DAYS PRIOR TO ANY EXCAVATION, TO LOCATE AND MARK EXISTING UTILITIES.

2. EXISTING UTILITY LINES SHOWN ARE APPROXIMATE LOCATIONS ONLY. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING UTILITY LINE LOCATIONS PRIOR TO ANY CONSTRUCTION. ANY DEVIATIONS FROM THE DESIGN LOCATIONS SHALL BE REPORTED TO THE OWNER OR ENGINEER PRIOR TO BEGINNING CONSTRUCTION.

3. THE CONTRACTOR WILL PROVIDE ALL NECESSARY PROTECTIVE MEASURES TO SAFE GUARD UTILITIES FROM DAMAGE DURING CONSTRUCTION OF THIS PROJECT. IN THE EVENT THAT SPECIAL EQUIPMENT IS REQUIRED TO WORK OVER AND AROUND THE UTILITIES, THE SITE CONTRACTOR WILL BE REQUIRED TO FURNISH SUCH EQUIPMENT. IF SERVICE IS INTERRUPTED CONTRACTOR IS RESPONSIBLE FOR RESTORING SERVICE BY REPAIRING THE DAMAGED UTILITY AT NO ADDITIONAL COST TO THE OWNER.

4. THE CONTRACTOR SHALL NOTIFY EACH INDIVIDUAL UTILITY OWNER OF HIS PLAN OF OPERATION IN THE AREA OF THE UTILITIES PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL CONTACT THE UTILITY OWNERS AND REQUEST THEM TO PROPERLY LOCATE THEIR UTILITY ON THE GROUND. THIS NOTIFICATION SHALL BE GIVEN AT LEAST (3) BUSINESS DAYS PRIOR TO COMMENCEMENT OF OPERATIONS AROUND THE UTILITY.

5. GRAVITY STORM AND SANITARY LINES SHALL BE INSTALLED PRIOR TO INSTALLATION OF WATER, ELECTRICAL, COMMUNICATION AND GEOTHERMAL LINES.

FIELD QUALITY CONTROL:
OWNER WILL ENGAGE A QUALIFIED TESTING AGENCY TO PERFORM THE SPECIAL INSPECTION AND QUALITY ASSURANCE TESTING AS REQUIRED IN ACCORDANCE WITH THE LATEST EDITION OF KENTUCKY BUILDING CODE CHAPTER 17 AND EARTHWORK SPECIFICATION. CONTRACTOR IS RESPONSIBLE FOR QUALITY CONTROL, SCHEDULING, PLANNING AND INSPECTION TO ENSURE PROPER TESTING BY OWNER'S TESTING AGENCY IN ACCORDANCE WITH GEOTECHNICAL RECOMMENDATIONS AND EARTHWORK SPECIFICATION.

IMPORT SOILS
CONTRACTOR SHALL INCLUDE ALL LABOR AND MATERIALS TO IMPORT SOIL FILL IN ACCORDANCE WITH THE GEOTECHNICAL REPORT RECOMMENDATION AS REQUIRED TO ACHIEVE PROPOSED ELEVATION. PRIOR TO BRINGING SOIL MATERIALS ON SITE, ANY OFF-SITE SOILS SHALL BE TESTED AND APPROVED BY THE OWNER TESTING AGENCY. IMPORT SOIL FILL SHALL BE UNIFORM AND CONSISTENT.

SOFT SOIL ALLOWANCES:

INCLUDE AN ALLOWANCE BASED ON THE FOLLOWING WORK SCOPE. THE CONTRACTOR SHALL INCLUDE IN THE BASE BID, AN ALLOWANCE TO REMOVE AND DISPOSE OFF-SITE AN ADDITIONAL 150 CY OF UNSUITABLE SOIL WHICH MAY BE ENCOUNTERED BELOW PLAN BOTTOM DEPTH. THE ALLOWANCE PRICE SHALL INCLUDE REPLACEMENT WITH 150 CY OF DGA PLACED AND COMPACTED IN ACCORDANCE WITH THE PROJECT GEOTECHNICAL REPORT AND ON-SITE TESTING AGENCY RECOMMENDATIONS. ACTUAL VOLUMES IN THE ALLOWANCE SHALL BE MEASURED BY THE ON-SITE TESTING AGENCY AND THE CONTRACT WILL BE ADJUSTED USING UNIT PRICES.

Kentucky 811
Know what's below.
Call before you dig.
Call 811 or 800-752-6007
www.kentucky811.org

SCALE: 1" = 20'-0"
SCALE IN FEET
0 10 20 60

SHERMAN CARTER BARNHART ARCHITECTS

COMMONWEALTH OF KENTUCKY ★ MICHAEL B. RICHES 19810 ★ LICENSED PROFESSIONAL ENGINEER

LEGRANDE ELEMENTARY
ADDITION AND RENOVATIONON
HART COUNTY BOARD OF EDUCATION
70 LeGRANDE SCHOOL ROAD
HORSE CAVE, KENTUCKY 42749

SITE GRADING AND DRAINAGE PLAN

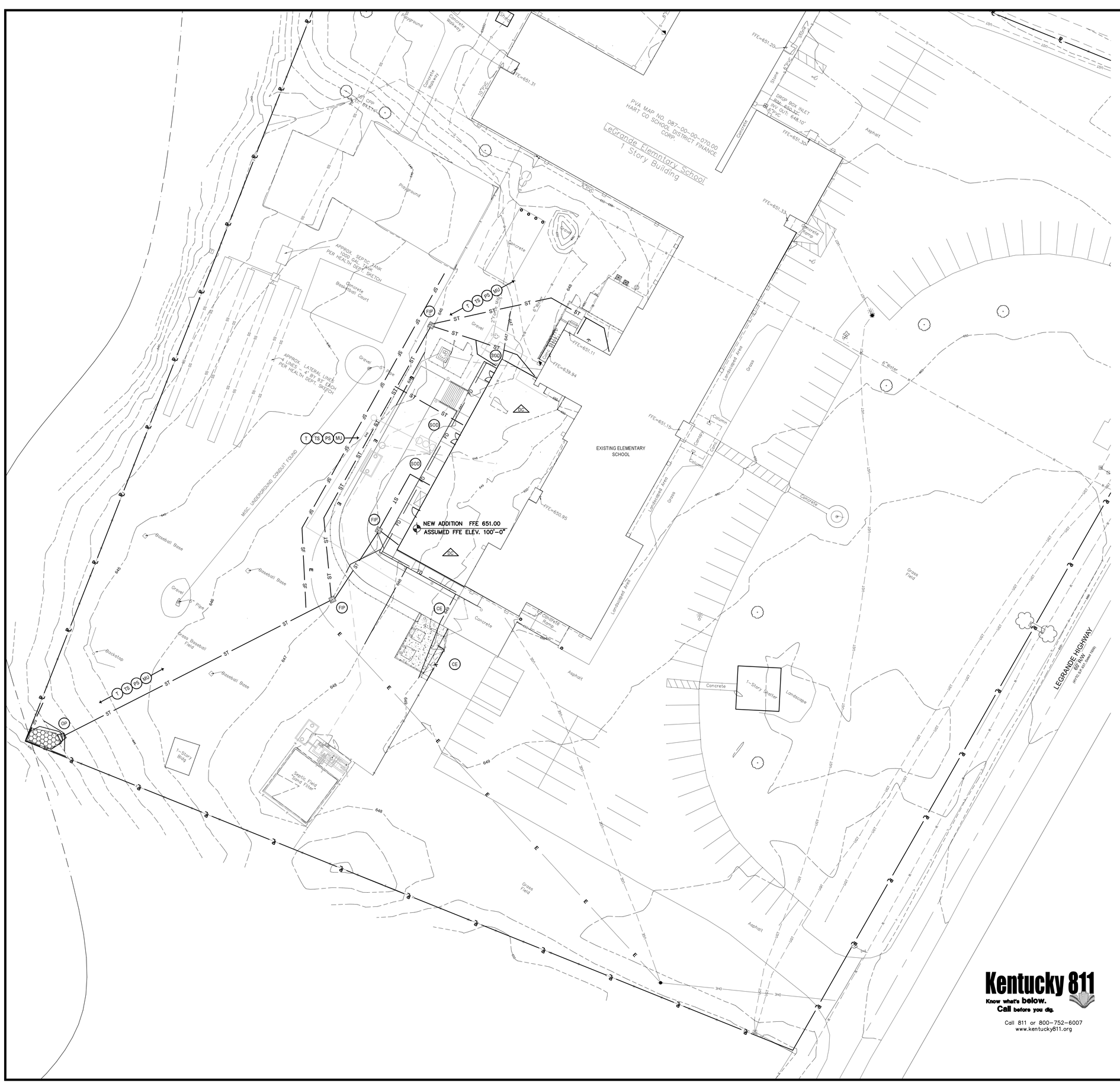
JOB NO.	2210
DATE	8/03/2023
DRAWN	MB
CHECKED	BKL

REVISIONS

No.	Description	Date

SHEET
SD2.0

X:\Projects\2022\2210_CORE\Bid\Arch\REF\2210_30X42_RSHT.dwg
Day & Time Aug 03, 2023 - 7:04pm
User Name mbeeks
Sheet Layout MODEL



EROSION CONTROL LEGEND

SYMBOLS	DESCRIPTION
CE	TEMPORARY STONE CONSTRUCTION ENTRANCE CE/SD4.1
SF	SILT FENCE SF/SD4.1
EDB	EROSION CONTROL BLANKETS SHORT-TERM DEGRADABLE BLANKET NORTH AMERICAN GREEN SC150BN OR EQ.
SLOPE STEPPER THAN 4:1 SLOPE STEPPER THAN 3:1	VELOCITY 8FPS & SHEAR STRESS 2.0 #/SQFT. VELOCITY 10FPS & SHEAR STRESS 2.5 #/SQFT. REFER TO MANUFACTURE SPECIFICATIONS FOR INSTALLATION REQUIREMENTS
PS	PERMANENT SEEDING REFER TO LANDSCAPING SPECIFICATION FOR DETAILS
MU	MULCHING
TS	TEMPORARY SEEDING
T	TOPSOILING
SOD	SOD ON MIN 6" TOPSOIL
OP	OUTLET PROTECTION OP/SD4.1
FIP	FILTER FABRIC INLET PROTECTION FIP/SD4.1
CWA	CONCRETE WASH AREA LOCATION PER CONTRACTOR. CWA/SD4.1
DC	DUST CONTROL USE OF WATER SPRAY FOR DUST CONTROL DURING EARTH WORK AND DEMOLITION. DUST CONTROL WATER RUNOFF SHALL BE CONTAINED AND MANAGED PROPERLY TO PREVENT THE TRANSPORT OF CONTAMINANTS FROM SITE.

EROSION SEDIMENT CONTROL NOTES

1. THE CONTRACTOR SHALL OBTAIN THE SERVICES OF THE APPROPRIATE PERSONNEL NEEDED TO CREATE AND MAINTAIN SWPPP, A BEST MANAGEMENT PRACTICES (BMP) PLAN IN ACCORDANCE WITH, KPDES STORMWATER GENERAL PERMIT KYR10, AND "KENTUCKY EROSION PREVENTION AND SEDIMENT CONTROL FIELD GUIDE."

2. THE EROSION CONTROL MEASURES NOTED AND SHOWN ARE MINIMUMS AND DO NOT RELIEVE THE CONTRACTOR FROM THE RESPONSIBILITY FOR COMPLIANCE WITH ANY AND ALL U.S. EPA AND / OR KENTUCKY DIVISION OF WATER REQUIREMENTS. CONTRACTOR IS RESPONSIBLE TO PROVIDE EROSION SEDIMENT CONTROL MEASURES IN ACCORDANCE WITH CONTRACTOR CONSTRUCTION METHODS AND SCHEDULE. ANY ADDITIONAL ITEMS THAT ARE REQUIRED BY THE GOVERNING AUTHORITIES SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER WHETHER THEY APPEAR ON THIS PLAN OR NOT.

3. PRIOR TO BEGINNING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING ALL REQUIRED PERMITS, AND NOTIFYING THE KENTUCKY DIVISION OF WATER IN WRITING OF INTENT TO DISTURB. THE CONTRACTOR SHALL OBTAIN, SIGN AND SUBMIT THE NOTICE OF INTENT (NOI) TO THE KENTUCKY DIVISION OF WATER. A COPY OF THE SUBMITTAL AND PERMIT SHALL BE SENT TO THE OWNER AND THE ARCHITECT.

4. ALL SILT FENCE SHALL BE INSTALLED PRIOR TO MOBILIZATION. SILT FENCES TO BE CLEANED OUT WHEN THEY BECOME ONE THIRD FULL OR AFTER EVERY RAIN IN EXCESS OF ONE HALF INCH.

5. THE CONTRACTOR SHALL, HAVE QUALIFIED PERSONNEL INSPECT AND ENSURE THAT ROUTINE MAINTENANCE AND NONROUTINE REPAIR IS PERFORMED TO KEEP THE BMP IN GOOD WORKING ORDER. ALL SEDIMENT AND EROSION CONTROL DEVICES SHALL BE INSPECTED EVERY SEVEN (7) DAYS OR AFTER EACH RAINFALL OCCURRENCE THAT EXCEEDS ONE-HALF (1/2) INCH. IF SITE INSPECTIONS IDENTIFY BMPS THAT ARE DAMAGED OR ARE NOT OPERATING EFFECTIVELY, MAINTENANCE MUST BE PERFORMED AS SOON AS PRACTICAL OR AS REASONABLY POSSIBLE AND BEFORE THE NEXT STORM EVENT WHENEVER PRACTICABLE. DAMAGED OR INEFFECTIVE DEVICES SHALL BE REPAIRED OR REPLACED, AS NECESSARY.

6. STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS PRACTICABLE IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. BARE SOIL AREAS MUST BE SEEDED, MULCHED OR COVERED AFTER 14 DAYS WHEN FINAL OR TEMPORARY GRADE IS ESTABLISHED IF NO WORK IS PLANNED IN THAT AREA DURING THE FOLLOWING 7 DAYS (I.E. 21 CONSECUTIVE DAYS). BUT IN NO CASE MORE THAN (21) DAYS AFTER WORK HAS CEASED, EXCEPT AS STATED BELOW WHERE STABILIZATION BY THE 21ST DAY IS PRECLUDED BY SNOW COVER OR FROZEN GROUND CONDITIONS STABILIZATION MEASURES MUST BE INITIATED AS SOON AS PRACTICABLE.
WHERE CONSTRUCTION ACTIVITY ON A PORTION OF THE SITE IS TEMPORARILY CEASED, AND EARTH-DISTURBING ACTIVITIES WILL BE RESUMED WITHIN 21 DAYS, TEMPORARY STABILIZATION MEASURES DO NOT HAVE TO BE INITIATED ON THAT PORTION OF THE SITE. TEMPORARY SEEDING SHALL BE PROVIDED IN ACCORDANCE WITH "KENTUCKY EROSION PREVENTION AND SEDIMENT CONTROL FIELD GUIDE"

7. TOPSOIL STOCKPILES AND BORROW SITES SHALL BE SURROUNDED BY SILT FENCES AND RESEEDED.

8. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR REMOVING DIRT AND CONSTRUCTION DEBRIS CAUSED BY CONSTRUCTION ACTIVITIES FROM THE ADJACENT ROADWAYS FOR THE DURATION OF THE PROJECT.

9. ALL POTENTIAL EROSION SHALL BE CONTROL IN SUCH MANNER SO AS TO PREVENT ANY DISPLACEMENT OF SILT TO THE ADJACENT PROPERTY OWNERS OR RIGTH-OF-WAY. THIS CONTROL SHALL BE IMPLEMENTED THROUGH PROPER INSTALLATION OF SILT FENCE DURING CONSTRUCTION AND MAINTAINED UNTIL PROPER GROUND COVER HAS BEEN ESTABLISHED.
IT IS THE CONTRACTOR'S RESPONSIBILITY TO PREVENT EROSION ONTO ADJACENT PROPERTY. ANY REMEDIAL MEASURES REQUIRED TO CORRECT DAMAGE CREATED BY EROSION SHALL BE AT THE CONTRACTOR'S EXPENSE.

10. THE EROSION CONTROL PLAN IS PREPARED AS GUIDE FOR INITIAL EROSION CONTROL MEASURES TO BE INSTALLED AT THE JOB SITE. IF EROSION OCCURS IN OTHER SPECIFIC AREAS OF THE PROPERTY DURING CONSTRUCTION, THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING SILT FENCE, OR OTHER EROSION CONTROL MEASURES AS NEEDED TO PREVENT EROSION AND/OR CONTROL SEDIMENTATION.

11. CONTRACTOR IS SOLELY RESPONSIBLE FOR THE REMOVAL OF EROSION PREVENTION AND SEDIMENTATION CONTROL STRUCTURES AFTER CONSTRUCTION IS COMPLETE, BUT ONLY AFTER PROPER GROUND COVER HAS BEEN ESTABLISHED.

12. THE EROSION SEDIMENT CONTROL PLAN IS CONSIDERED A "LIVING DOCUMENT". THE SWPPP WILL BE REVISED FOR ANY OF THE FOLLOWING REASONS:

- WHEN THERE IS A CHANGE IN DESIGN, CONSTRUCTION, OPERATION, PROCEDURES, OR MAINTENANCE OF THE FACILITY THAT HAS A SIGNIFICANT EFFECT ON THE POTENTIAL TO CAUSE STORM WATER POLLUTION
- IF IT IS DISCOVERED THAT THE SWPPP FAILS TO PROTECT THE WATERS OF THE U.S. FROM POLLUTION
- IF AN EVALUATION OR INSPECTION RESULTS IN THE NEED FOR REVISION OF THE SWPPP

13. ANY ALTERATIONS OR REVISIONS TO THE BEST MANAGEMENT PRACTICES / EROSION CONTROL (BMP) PLAN BASED ON THE RESULTS OF THE INSPECTION SHALL BE IMPLEMENTED WITHIN SEVEN (7) DAYS. A REPORT SUMMARIZING THE SCOPE OF THE INSPECTION, NAMES AND QUALIFICATIONS OF PERSONNEL MAKING THE INSPECTION, THE DATE OF THE INSPECTION, MAJOR OBSERVATIONS RELATING TO THE IMPLEMENTATION OF THE BMP PLAN, AND ANY CORRECTIVE ACTIONS TAKEN SHALL BE MADE AND KEPT AS PART OF THE BMP PLAN FOR AT LEAST THREE (3) YEARS AFTER THE DATE OF INSPECTION, OR UNTIL ONE (1) YEAR AFTER COVERAGE UNDER THIS PERMIT ENDS. THE REPORT SHALL BE SIGNED IN ACCORDANCE WITH PART II OF THIS PERMIT.

14. A COPY OF THE APPROVED SWPPP, EROSION AND SEDIMENT CONTROL PLANS AND COPIES OF THE WEEKLY INSPECTION REPORT SHALL BE MAINTAINED ON THE SITE AT ALL TIMES IN THE JOB TRAILER.

15. PROVIDE SILT FENCE AND/OR OTHER CONTROL DEVICES, AS MAY BE REQUIRED, TO CONTROL SOIL EROSION DURING UTILITY CONSTRUCTION. ALL DISTURBED AREAS SHALL BE CLEANED, GRADED, AND STABILIZED WITH GRASSING IMMEDIATELY AFTER THE UTILITY INSTALLATION. FILL, COVER, AND TEMPORARY SEEDING AT THE END OF EACH DAY ARE RECOMMENDED. IF WATER IS ENCOUNTERED WHILE TRENCHING, THE WATER SHOULD BE FILTERED TO REMOVE ANY SEDIMENTS BEFORE BEING PUMPED BACK.

16. ALL EROSION CONTROL DEVICES SHALL BE PROPERLY MAINTAINED DURING ALL PHASES OF CONSTRUCTION UNTIL THE COMPLETION OF ALL CONSTRUCTION ACTIVITIES AND ALL DISTURBED AREAS HAVE BEEN STABILIZED. ADDITIONAL CONTROL DEVICES MAY BE REQUIRED DURING CONSTRUCTION IN ORDER TO CONTROL EROSION AND/OR OFFSITE SEDIMENTATION. ALL TEMPORARY CONTROL DEVICES SHALL BE REMOVED ONCE CONSTRUCTION IS COMPLETE AND THE SITE IS STABILIZED.

17. TEMPORARY DIVERSION BERMS AND/OR DITCHES SHALL BE PROVIDED AS NEEDED DURING CONSTRUCTION TO PROTECT WORK AREAS FROM UPSLOPE RUNOFF AND/OR TO DIVERT SEDIMENT-LADEN WATER TO APPROPRIATE TRAPS OR STABLE OUTLETS.

18. THE CONTRACTOR MUST TAKE NECESSARY ACTION TO MINIMIZE THE TRACKING OF MUD ONTO PAVED ROADWAY(S) FROM CONSTRUCTION AREAS AND THE GENERATION OF DUST. THE CONTRACTOR SHALL DAILY REMOVE MUD/SOIL FROM PAVEMENT, AS NEEDED BUT NOT LESS THAN DAILY.

19. LITTER, CONSTRUCTION DEBRIS, OILS, FUELS, AND BUILDING PRODUCTS WITH SIGNIFICANT POTENTIAL FOR IMPACT (SUCH AS STOCKPILES OF FRESHLY TREATED LUMBER) AND CONSTRUCTION CHEMICALS THAT COULD BE EXPOSED TO STORM WATER MUST BE PREVENTED FROM BECOMING A POLLUTANT SOURCE IN STORM WATER DISCHARGES.

20. CONTAMINATED MATERIALS:
ALL PAINT, SOLVENT, PETROLEUM PRODUCTS (FUEL, LUBE OILS, GREASE AND CUTTING OILS) AND PETROLEUM WASTE PRODUCTS SHALL BE STORED IN CONTAINERS (SUCH AS DRUMS, CANS, OR CARTONS) SO THAT THESE MATERIALS ARE NOT EXPOSED TO STORM WATER. SUFFICIENT PRACTICES OF SPILL PREVENTION CONTROL AND/OR MANAGEMENT SHALL BE PROVIDED TO PREVENT ANY SPILLS OF THESE POLLUTANTS FROM ENTERING A WATER OF THE STATE. ANY CONTAINMENT SYSTEM USED TO IMPLEMENT THIS REQUIREMENTS SHALL BE CONSTRUCTED OF MATERIALS COMPATIBLE WITH THE SUBSTANCES CONTAINED AND ALSO PREVENT CONTAMINATION OF GROUNDWATER.

A. CHEMICAL MANAGEMENT:
DO NOT STORE CHEMICALS, DRUMS AND BAGGED MATERIAL DIRECTLY ON THE GROUND. USE SECONDARY CONTAINMENT. USE WOODEN PALLETS. PROVIDE SPILL CONTAINMENT DIKES AROUND CHEMICAL AND FUEL STORAGE TANKS. LINE WITH PLASTIC FILM TO PREVENT SOIL CONTAMINATION. STORE HAZARDOUS WASTES IN AN APPROPRIATE TYPE PF CONTAINER AND PROPERLY LABELED PER EPA, OSHA AND DOT REQUIREMENTS.

B. SOLID WASTE MANAGEMENT:
ONSITE TRASH SHOULD BE COLLECTED AND DISPOSED OF ON REGULAR BASIS. SANITARY SYSTEMS SHOULD BE REGULARLY SERVICED REPAIR TRASH CONTAINERS AND DUMPSTERS ON AS-NEEDED BASIS. WHERE POSSIBLE PROVIDE COVER FOR WASTE CONTAINERS TO PREVENT THE ENTRY OF RAINWATER AND LOSS OF CONTENTS BY WIND.MAINTAIN A CONTINGENCY PLAN IN THE CASE THAT HAZARDOUS OR TOXIC MATERIALS ARE DISCOVERED.

C. EQUIPMENT MAINTENANCE:
MAINTAIN WASTE FLUID CONTAINERS IN LEAK PROOF CONDITION. VEHICLES AND EQUIPMENT SHOULD BE INSPECTED ON EACH DAY OF USE. LEAKS SHOULD BE REPAIRED IMMEDIATELY OR THE PROBLEM VEHICLE(S) OR EQUIPMENT SHOULD BE REMOVED FROM THE PROJECT SITE.

D. DESIGNATED WASH DOWN AREAS: (BY GENERAL CONTRACTOR)
PERFORM WASHOUT OF CONCRETE IN DESIGNATED AREAS ONLY. PLASTIC LINING MATERIAL SHOULD BE A MINIMUM OF 10 MIL POLYETHYLENE SHEETING AND SHOULD FREE OF HOLES, TEARS OR OTHER DEFECTS. HARDENED CONCRETE SHOULD BE BROKEN UP, REMOVED AND DISPOSED OF IN ACCORDANCE WITH SOLID WASTE MANAGEMENT. MONITOR ON SITE CONCRETE WASTE STORAGE AND DISPOSAL PROCEDURE AT LEAST WEEKLY.

E. SPILL CONTAINMENT PLAN.
COMPLY WITH SUGGESTIONS AND REQUIREMENTS SET BY LOCAL FIRE DEPARTMENT. VERIFY WEEKLY THAT SPILL CONTROL CLEAN UP MATERIALS ARE LOCATED NEAR MATERIAL STORAGE, UNLOADING AND USE AREAS. RESTOCK APPROPRIATE CLEAN UP MATERIALS AFTER A SPILL INCIDENT HAS OCCURRED.

21. AFTER COMPLETION OF CONSTRUCTION, THE CONTRACTOR SHALL PERFORM SITE CLEANUP TO REMOVE ALL TRASH, DEBRIS, EXCESS MATERIALS, EQUIPMENT, AND OTHER DELETERIOUS MATERIALS ASSOCIATED WITH CONSTRUCTION. THE SITE CONTRACTOR IS EXPRESSLY RESPONSIBLE FOR ENSURING THE SITE IS CLEAN AND IN OPERABLE CONDITION AT THE TIME OF FINAL ACCEPTANCE.

22. REMOVE TEMPORARY SEDIMENT CONTROL MEASURES WITHIN 30 DAYS AFTER FINAL STABILIZATION IS ACHIEVED AND TEMPORARY BEST MANAGEMENT PRACTICES (BMPS) ARE NO LONGER NEEDED.

23. ALL SLOPES 4:1 AND STEEPER THAN 4:1 SHALL REQUIRE EROSION CONTROL BLANKET S150 NORTH AMERICAN GREEN OR EQ. REFER TO MANUFACTURE SPECIFICATIONS FOR ADDITIONAL INFORMATION.

SEEDING AND SODDING NOTES:

1. ALL AREAS DISTURBED BY CONSTRUCTION WHICH ARE NOT BUILT UPON OR PLANTED IN SOME OTHER FASHION SHALL RECEIVE A MINIMUM OF 6" OF TOPSOIL AND BE SODDED IN ACCORDANCE WITH THE SPECIFICATIONS EXCEPT WHERE PLANTINGS ARE INDICATED, OR OTHERWISE SHOWN ON PLAN. THE CONTRACTOR SHALL SUPPLY NATURALLY OCCURRING, HIGH QUALITY TOPSOIL. LAWNS ARE TO RECEIVE 6" MINIMUM TOPSOIL ON CLAY AND MIN 12" TOPSOIL ON ROCK.

SHERMAN CARTER BARNHART ARCHITECTS
COMMONWEALTH OF KENTUCKY
MICHAEL B. HUGHES
19810
LICENSED PROFESSIONAL ARCHITECT

LEGRANDE ELEMENTARY ADDITION AND RENOVATIONON

HART COUNTY BOARD OF EDUCATION
70 LeGRANDE SCHOOL ROAD
HORSE CAVE, KENTUCKY 42749

EROSION SEDIMENT CONTROL AND TRAFFIC CONTROL PLAN

JOB NO.	2210
DATE	8/03/2023
DRAWN	MB
CHECKED	BKL

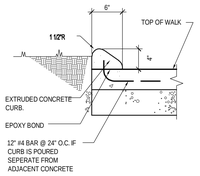
REVISIONS

No.	Description	Date

SHEET

SD2.1

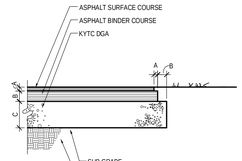
X:\Projects\2022\2210_CORE\Site\XREF\2210_30X42_ASHT.dwg
Day & Time: Aug 03, 2023 - 7:06pm
Layout Name: ASHT
Sheet Layout: MODEL



CONTRACTOR'S OPTIONS TO EXTRUDE OR POUR MONOLITHIC WITH CONCRETE WALK.

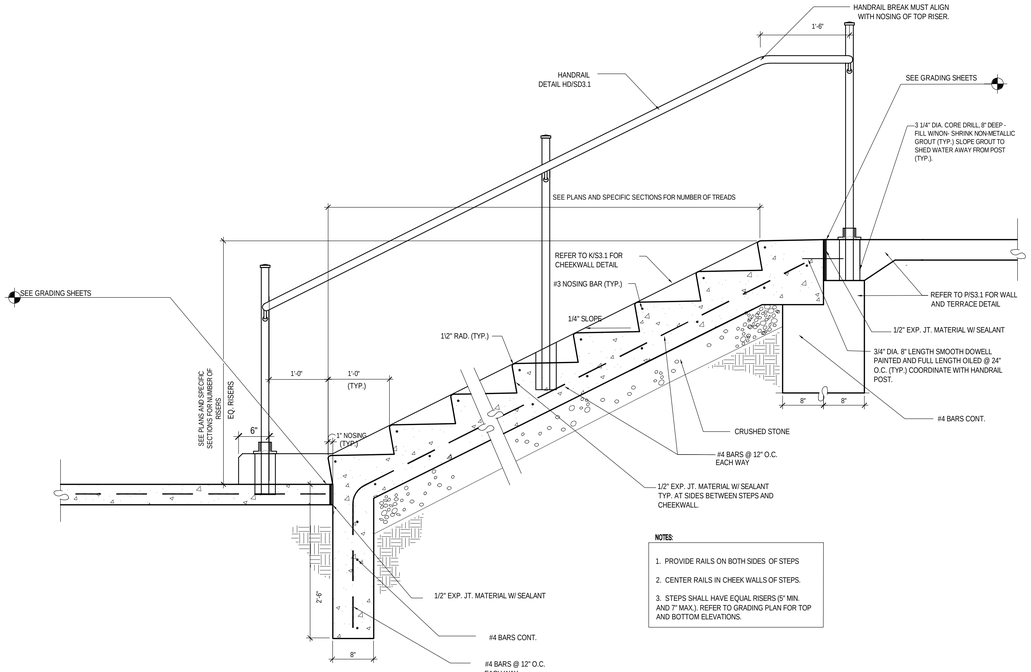
4" CONCRETE CURB DETAIL CC
1" = 1'-0"

DIM.	LIGHT DUTY	HEAVY DUTY
A	1 1/2"	1 1/2"
B	2 1/2"	3"
C	6"	10"



ASPHALT PAVEMENT DESIGN SHALL EXCEED GEOTECHNICAL REPORT RECOMMENDATIONS AS SHOWN.

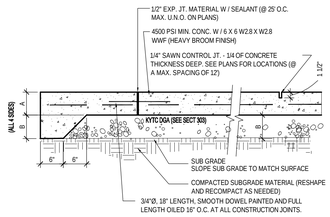
ASPHALT PAVEMENT DETAIL AP
N.T.S.



NOTES:

1. PROVIDE RAILS ON BOTH SIDES OF STEPS
2. CENTER RAILS IN CHEEK WALLS OF STEPS.
3. STEPS SHALL HAVE EQUAL RISERS (5" MIN. AND 7" MAX.). REFER TO GRADING PLAN FOR TOP AND BOTTOM ELEVATIONS.

CONCRETE STEP DETAIL SD
1" = 1'-0"



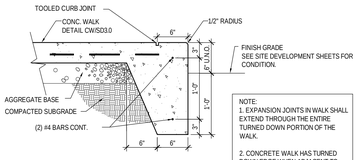
DIM.	
A	6"
B	4"

SEAL EXPANSION AND CONTROL JOINTS PER KTC STANDARD DRAWINGS RPX-020-04 AND RPX-010-03 FOR CONCRETE PAVING.

CONTROL JOINT SPACING IS DIRECTLY RELATED TO THICKNESS OF CONCRETE PER ACI 330.

PAVEMENT DESIGN SHALL EXCEED GEOTECHNICAL REPORT RECOMMENDATIONS AS SHOWN.

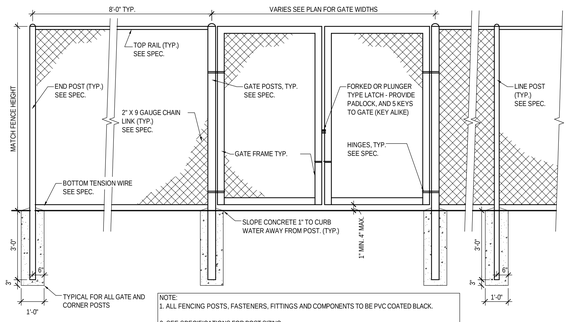
CONCRETE PAVING CP
N.T.S.



NOTE:
1. EXPANSION JOINTS IN WALK SHALL EXTEND THROUGH THE ENTIRE TURNED DOWN PORTION OF THE WALK.

2. CONCRETE WALK HAS TURNED DOWN EDGE WHEN ADJACENT TO PAVEMENT. U.N.O.

CONCRETE WALK WITH TURNED DOWN EDGE TW
1" = 1'-0"



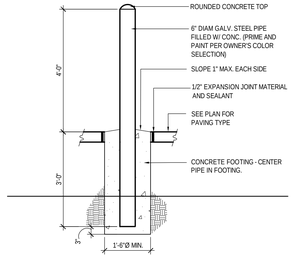
NOTE:
1. ALL FENCING POSTS, FASTENERS, FITTINGS AND COMPONENTS TO BE PVC COATED BLACK.

2. SEE SPECIFICATIONS FOR POST SIZING.

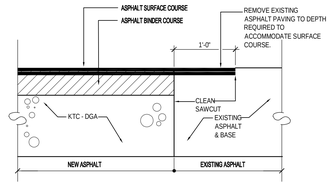
3. REINFORCE AND BRACE GATE AS REQUIRED BY CHAINLINK GATE COMPANY TO SPAN REQUIRED OPENING.

5. SEE PLANS FOR SWING GATES.

CHAINLINK FENCE AND SWING GATE DETAIL CF
N.T.S.



PIPE BOLLARD BD
N.T.S.



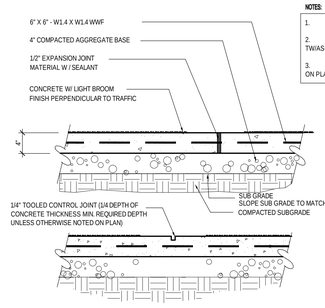
EDGE KEY EK
N.T.S.

NOTES:

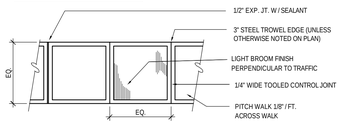
1. SEE PLAN FOR CONTROL JOINTS

2. TURN DOWN WALK EDGE WHERE WALK MEETS PAVEMENT (REFER TO DETAIL TW/AS-201)

3. U.N.O. EXPANSION JOINTS SHALL BE SPACED 50' MAX. O.C. AND WHERE SHOWN ON PLAN. CONTROL JOINTS SHALL BE PLACED 8' MAX. O.C.



CONTRACTOR TO PROVIDE SMOOTH TROWLED CUSTOM 3" BORDER FOR CONCRETE PATTERN. (WIDTH OF BORDER SHALL BE EQUAL AT EDGES AND TOOLED JOINTS. USE CUSTOM FINISHING TOOLS AS REQUIRED.)



CONCRETE WALK CW
N.T.S.

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
DAVID MICHAEL DIAZ
1021
REGISTERED LANDSCAPE ARCHITECT

LEGRANDE ELEMENTARY ADDITION AND RENOVATIONON

HART COUNTY BOARD OF EDUCATION
70 LeGRANDE SCHOOL ROAD
HORSE CAVE, KENTUCKY 42749

SITE DETAILS

JOB NO.	2210
DATE	8/03/2023
DRAWN	DMD
CHECKED	BKL

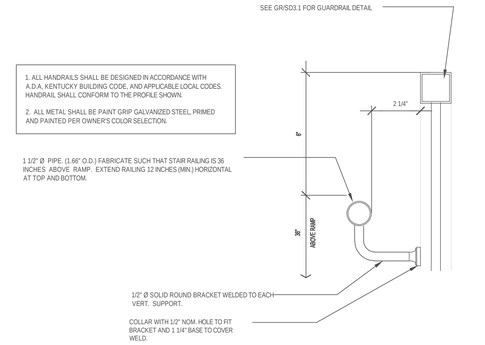
REVISIONS

No.	Description	Date
—		

SHEET

SD-3.0

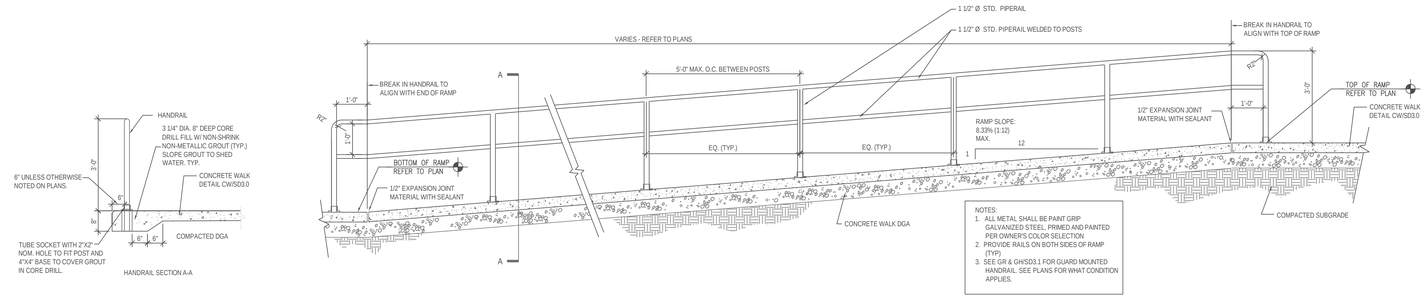
X:\Projects\2022\2210_CORE\Site\2210_SD3X.dwg
Layout Name: Aug 02, 2023 - 7:39pm
Login Name: dmd
Sheet Layout: MODEL



GUARDRAIL WITH HANDRAIL

N.T.S.

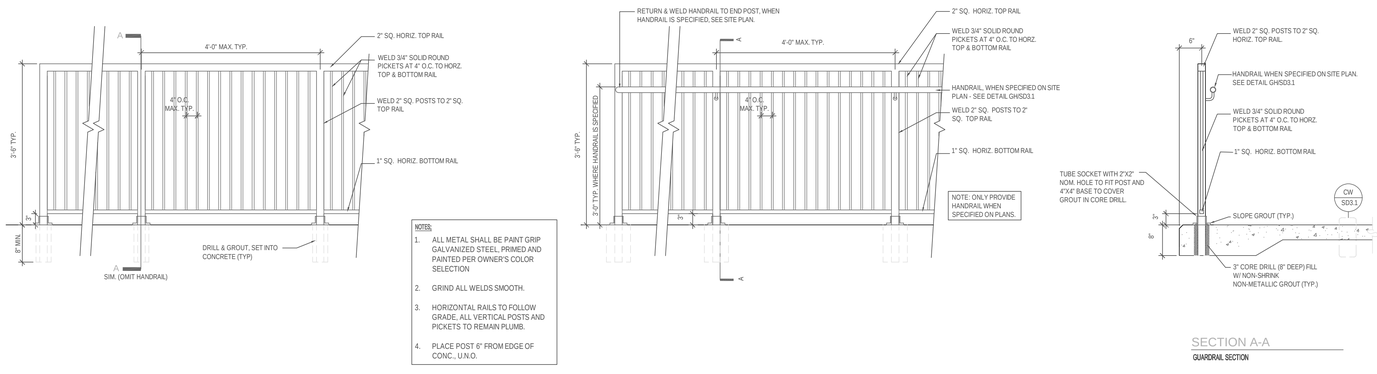
GH



RAMP SECTION AND HANDRAIL DETAIL

1/2" = 1'-0"

HD



GUARDRAIL ELEVATION

GUARDRAIL WITH HANDRAIL ELEVATION

SECTION A-A

GUARDRAIL SECTION

GUARDRAIL

3/4" = 1'-0"

GR

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY DAVID MICHAEL DIAZ 1021 REGISTERED LANDSCAPE ARCHITECT

LEGRANDE ELEMENTARY ADDITION AND RENOVATIONON

HART COUNTY BOARD OF EDUCATION
70 LeGRANDE SCHOOL ROAD
HORSE CAVE, KENTUCKY 42749

SITE DETAILS

JOB NO.	2210
DATE	8/03/2023
DRAWN	DMD
CHECKED	BKL

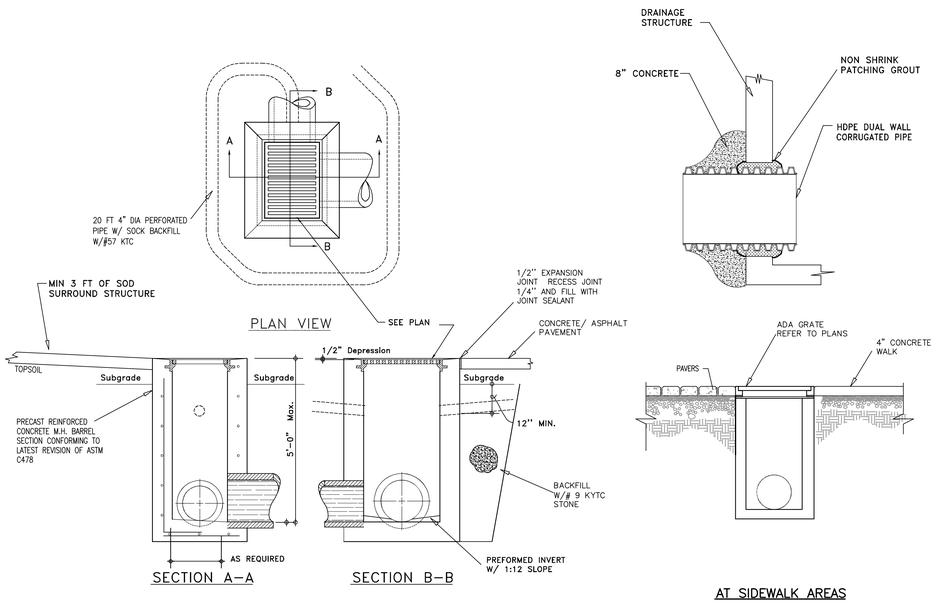
REVISIONS

No.	Description	Date
1	POST BID ADDENDUM 1	1/13/2023

SHEET

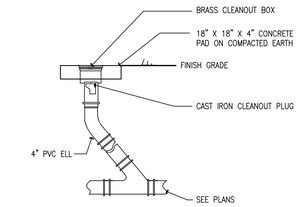
SD-3.1

X:\Projects\2022\2210_CORE\Site\2210_SD3X.dwg
Date & Time: April 03, 2023 - 10:02pm
Login Name: ddiaz
Sheet Layout: MODEL



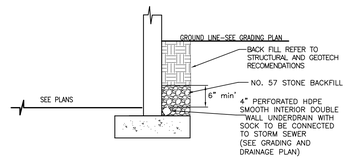
DROP INLET
N.T.S. DIMENSIONS AND REINFORCEMENT DESIGN BY PRECAST MANUFACTURER

DI



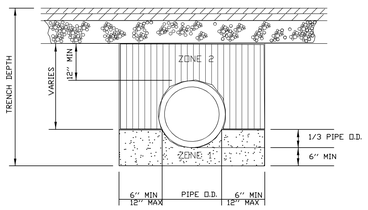
EXTERIOR CLEANOUT DETAIL
N.T.S.

CO



FOUNDATION DRAIN DETAIL
N.T.S.

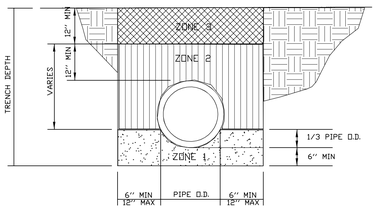
FD



STORM SEWER TRENCH IN PAVED AREAS

ZONE 2 – COMPACTED KTC NO. 9 STONE
(FOR PIPING UNDER AND WITHIN 3' OF PAVED AREAS.)

ZONE 1 – PIPE BEDDING MATERIAL, KTC NO. 9 STONE

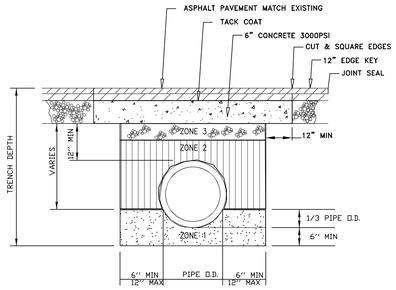


STORM SEWER TRENCH IN NON-PAVED AREAS

ZONE 3 – COMPACTED SOIL BACKFILL
(COMPACT SOIL IN 6" LIFTS)

ZONE 2 – COMPACTED SELECT MATERIAL KTC #9 OR EQ.

ZONE 1 – PIPE BEDDING MATERIAL, KTC NO. 9 STONE



STORM INSTALLATION UNDER STREET PAVEMENT
PAVEMENT RESTORATION

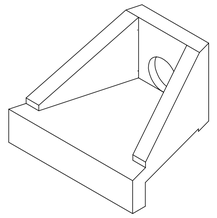
ZONE 3 – 6" MIN COMPACTED DGA

ZONE 2 – COMPACTED KTC NO. 9 STONE
(FOR PIPING UNDER AND WITHIN 3' OF PAVED AREAS.)

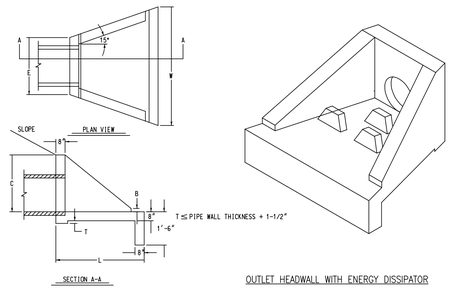
ZONE 1 – PIPE BEDDING MATERIAL, KTC NO. 9 STONE

PIPE BEDDING DETAILS — FOR EXTERIOR STORM PIPING ONLY UNO

ST



INLET HEADWALL

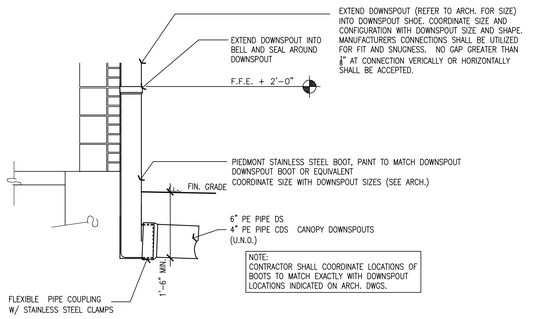


OUTLET HEADWALL WITH ENERGY DISSIPATOR

DIMENSIONS						
PIPE DIA.	C	L	W	E	B	WEIGHT
12" & 15"	2'-0"	4'-0"	4'-9"	2'-9"	0'-3"	3,040 LBS
18" & 24"	2'-9"	5'-6"	6'-6"	3'-6"	0'-3"	5,470 LBS
30" & 36"	4'-4"	5'-0"	8'-8"	3'-8"	1'-6"	8,700 LBS

STANDARD HEADWALL(15"–30")
N.T.S. DIMENSIONS AND REINFORCEMENT DESIGN BY PRECAST MANUFACTURER

SHW



DOWNSPOUT CONNECTION DETAIL
N.T.S.

DS EDS

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY LICENSED PROFESSIONAL ENGINEER
MICHAEL B. BASHKHES 19810

LEGRANDE ELEMENTARY ADDITION AND RENOVATIONON
HART COUNTY BOARD OF EDUCATION
70 LeGRANDE SCHOOL ROAD
HORSE CAVE, KENTUCKY 42749

SITE DETAILS

JOB NO.	2210
DATE	8/03/2023
DRAWN	MB,
CHECKED	BKL

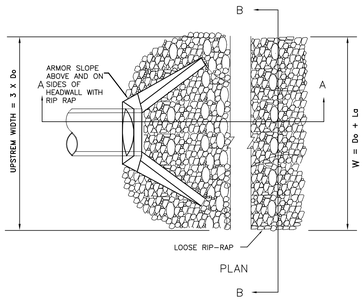
REVISIONS

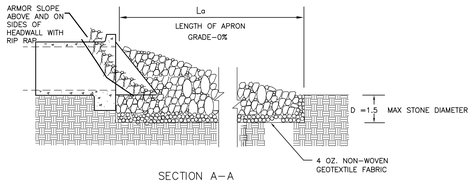
No.	Description	Date

SHEET

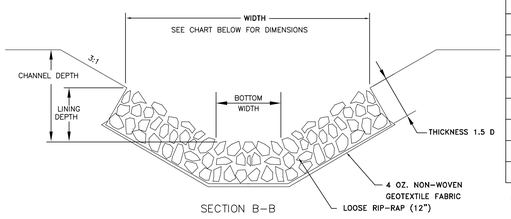
SD4.0

X:\Projects\2022\2210_CORE\Site\XREF\2210_3DX42_RSHT.dwg
Date & Time: 8/2/2023 7:06pm
Login Name: mbashkhes
Sheet Layout: MODEL





SECTION A–A



SECTION B–B

DIMENSIONS					
PIPE Do	LINING DEPTH	La*	UPSTREAM WIDTH	THICKNESS	GRADED RIP-RAP d50 (AVERAGE ROCK DIAMETER)
8"	10"	5–7'	2–3'	6"	3"
12"	16"	8–12'	3–4'	10"	5"
15"	20"	16–18'	4–6'	14"	8"
18"	24"	18–20'	4–6'	16"	10"
24"	36"	20–24'	6–8'	18"	12"
30"	48"	24–28'	8–10'	20"	12"
36"	52"	28–32'	10–12'	22"	14"
42"	66"	32–38'	12–14'	24"	16"
48"	66"	44–48'	14–16'	30"	20"

* HIGH FLOW PRESSURE HEAD CULVERTS

INSTALLATION
RIPRAP PLACEMENT SHOULD BE COMPLETED WITHIN A SHORT TIME PERIOD (LESS THAN A WEEK) TO MINIMIZE POTENTIAL DAMAGE RESULTING FROM STORMWATER RUNOFF.

WHEN USED AS SLOPE PROTECTION, RIP RAP SHOULD BE KEYED INTO THE SLOPE TOE BY AT LEAST THE GREATER OF 6 INCHES OR ONE HALF RIPRAP DIAMETER.

RIPRAP SHOULD NOT BE PLACED UNTIL FINAL SUBGRADE ELEVATION HAS BEEN ACHIEVED

GEOTEXTILE SHOULD BE INSTALLED TO MAINTAIN SEPARATION O FROCK MATERIAL FROM THE UNDERLYING SOIL. GEOTEXTILE SHOULD NOT BE SKETCHED OR OTHERWISE COMPROMISED. SECURE FABRIC WITH ANCHOR TRENCHES, STAKES, STAPLES OR ANY OTHER METHOD RECOMMENDED BY THE MANUFACTURER.

RUBBLE–STONE RIPRAP (PLAIN)

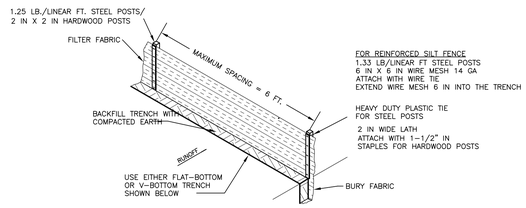
RUBBLE–STONE RIPRAP SHOULD CONSIST OF AT LEAST 90% OF THE STONE NOT LESS THAN 8 INCHES WIDE BY 12 INCHES LONG BY 12 INCHES DEEP AND SHOULD BE APPROXIMATELY RECTANGULAR IN SHAPE. RUBBLE–STONE SHOULD BE HAND PLACED SO THAT THE STONES ARE CLOSE TOGETHER, ARE STAGGERED AT ALL JOINTS AS FAR AS POSSIBLE, AND ARE PLACED SO AS TO REDUCE THE VOIDS TO A MINIMUM. THE MAIN STONE SHOULD BE THOROUGHLY "CHINKED" OR ANCHORED IN PLACE WITH 1 IN. TO 3–IN. STONES BY THROWING THEM OVER THE SURFACE IN ANY MANNER THAT IS PRACTICAL FOR THE SMALLER STONES TO FILL THE VOIDS.

THE STANDARD DEPTH SHOULD BE 24 INCHES. THE AVERAGE DEPTH SHOULD NOT BE LESS THAN CHANNEL LINING SHALL BE ESTIMATED ON THE BASIS OF 1.00 TON PER SQ

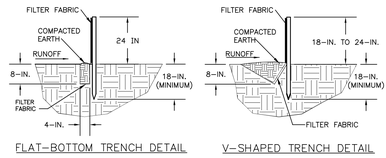
WHEN RUBBLE–STONE RIP–RAP IS CONSTRUCTED IN LAYERS, THE LAYERS SHOULD BE THOROUGHLY TIED TOGETHER WITH LARGE STONES PROTRUDING FROM ONE LAYER INTO THE OTHER.

CULVERT OUTLET PROTECTION (OP)

N.T.S.



SILT FENCE INSTALLATION



FLAT–BOTTOM TRENCH DETAIL

V–SHAPED TRENCH DETAIL

SILT FENCE DETAIL

WHEN AND WHERE TO USE It

SILT FENCE IS APPLICABLE IN AREAS:

WHERE THE MAXIMUM SHEET OR OVERLAND FLOW PATH LENGTH TO THE FENCE IS 100–FEET. WHERE THE MAXIMUM SLOPE STEEPNESS (NORMAL [PERPENDICULAR] TO FENCE LINE) IS 2H:1V. THAT DO NOT RECEIVE CONCENTRATED FLOWS GREATER THAN 0.5 CFS. THE FENCE SHOULD BE PLACED ACROSS THE SLOPE ALONG A LINE OF UNIFORM ELEVATION (PERPENDICULAR TO THE DIRECTION OF FLOW). THE FENCE SHOULD BE LOCATED AT LEAST 10 –FEET FROM THE TOE OF SLOPES TO PROVIDE SEDIMENT STORAGE AND ACCESS FOR MAINTENANCE AND CLEAN OUT.

DO NOT PLACE SILT FENCE ACROSS CHANNELS OR USE IT AS A VELOCITY CONTROL BMP.

GEOTEXTILE FILTER FABRIC

FILTER FABRIC IS: COMPOSED OF FIBERS CONSISTING OF LONG CHAIN SYNTHETIC POLYMERS COMPOSED OF AT LEAST 85% BY WEIGHT OF POLYOLEFINS, POLYESTERS, OR POLYAMIDES. FORMED INTO A NETWORK SUCH THAT THE FILAMENTS OR YARNS RETAIN DIMENSIONAL STABILITY RELATIVE TO EACH OTHER. FREE OF ANY TREATMENT OR COATING WHICH MIGHT ADVERSELY ALTER ITS PHYSICAL PROPERTIES AFTER INSTALLATION. FREE OF DEFECTS OR FLAWS THAT SIGNIFICANTLY AFFECT ITS PHYSICAL AND/OR FILTERING PROPERTIES. CUT TO A MINIMUM WIDTH OF 36 INCHES.

INSTALLATION

EXCAVATE A TRENCH APPROXIMATELY 6–INCHES WIDE AND 6–INCHES DEEP WHEN PLACING FABRIC BY HAND.

PLACE 12–INCHES OF GEOTEXTILE FABRIC INTO THE 6–INCH DEEP TRENCH, EXTENDING THE REMAINING 6–INCHES TOWARDS THE UPSLOPE SIDE OF THE TRENCH. BACKFILL THE TRENCH WITH SOIL OR GRAVEL AND COMPACT. BURY 12–INCHES OF FABRIC INTO THE GROUND WHEN PNEUMATICALLY INSTALLING SILT FENCE WITH A SLICING METHOD.

PURCHASE FABRIC IN CONTINUOUS ROLLS AND CUT TO THE LENGTH OF THE BARRIER TO AVOID JOINTS. WHEN JOINTS ARE NECESSARY, WRAPPED THE FABRIC TOGETHER AT A SUPPORT POST WITH BOTH ENDS FASTENED TO THE POST, WITH A 6–INCH MINIMUM OVERLAP.

INSTALL POSTS TO A MINIMUM DEPTH OF 24–INCHES. INSTALL POSTS A MINIMUM OF 1– TO 2– INCHES ABOVE THE FABRIC, WITH NO MORE THAN 3–FEET OF THE POST ABOVE THE GROUND.

SPACE POSTS TO MAXIMUM 6–FEET CENTERS. ATTACH FABRIC TO WOOD POSTS USING STAPLES MADE OF HEAVY–DUTY WIRE AT LEAST 1½–INCH LONG, SPACED A MAXIMUM OF 6–INCHES APART. STAPLE A 2–INCH WIDE LATHE OVER THE FILTER FABRIC TO SECURELY FASTEN IT TO THE UPSLOPE SIDE OF WOODEN POSTS.

ATTACH FABRIC TO THE STEEL POSTS USING HEAVY–DUTY PLASTIC TIES THAT ARE EVENLY SPACED AND PLACED IN A MANNER TO PREVENT SAGGING OR TEARING OF THE FABRIC. IN CALL CASES, TIES SHOULD BE AFFIXED IN NO LESS THAN 4 PLACES.

INSTALL THE FABRIC A MINIMUM OF 24–INCHES ABOVE THE GROUND. WHEN NECESSARY, THE HEIGHT OF THE FENCE ABOVE GROUND MAY BE GREATER THAN 24–INCHES.

LOCATE SILT FENCE CHECKS EVERY 100 FEET MAXIMUM AND AT LOW POINTS. INSTALL THE FENCE PERPENDICULAR TO THE DIRECTION OF FLOW AND PLACE THE FENCE THE PROPER DISTANCE FROM THE TOE OF STEEP SLOPES TO PROVIDE SEDIMENT STORAGE AND ACCESS FOR MAINTENANCE AND CLEANOUT.

INSPECTION AND MAINTENANCE

INSPECT EVERY SEVEN CALENDAR DAYS AND WITHIN 24–HOURS AFTER EACH RAINFALL EVENT THAT PRODUCES ½–INCHES OR MORE OF PRECIPITATION.

CHECK FOR SEDIMENT BUILDUP AND FENCE INTEGRITY.

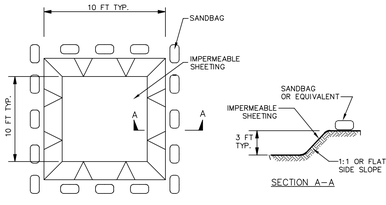
CHECK WHERE RUNOFF HAS ERODED A CHANNEL BENEATH THE FENCE, OR WHERE THE FENCE HAS SAGGED OR COLLAPSED BY FENCE OVERTOPPING. IF THE FENCE FABRIC TEARS, BEGINS TO DECOMPOSE, OR IN ANY WAY BECOMES INEFFECTIVE, REPLACE THE SECTION OF FENCE IMMEDIATELY.

REMOVE SEDIMENT ACCUMULATED ALONG THE FENCE WHEN IT REACHES 1/3 THE HEIGHT OF THE FENCE, ESPECIALLY IF HEAVY RAINS ARE EXPECTED. REMOVE TRAPPED SEDIMENT FROM THE SITE OR STABILIZE IT ON SITE.

REMOVE SILT FENCE WITHIN 30 DAYS AFTER FINAL STABILIZATION IS ACHIEVED OR AFTER TEMPORARY BEST MANAGEMENT PRACTICES (BMPS) ARE NO LONGER NEEDED. PERMANENTLY STABILIZE DISTURBED AREAS RESULTING FROM FENCE REMOVAL

REINFORCED SILT FENCE / SILT FENCE (SF RSF)

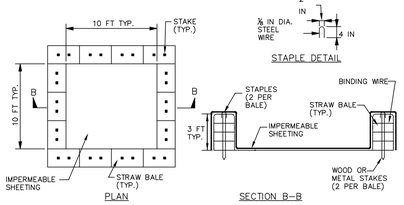
N.T.S.



SECTION A–A

PLAN

EXCAVATED WASHOUT STRUCTURE

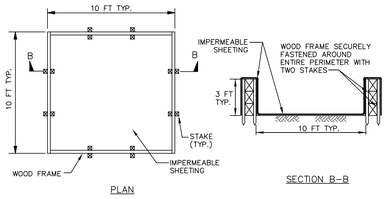


PLAN

SECTION B–B

NOTE: CAN BE TWO STACKED BALES OR PARTIALLY EXCAVATED TO REACH 3 FT DEPTH

WASHOUT STRUCTURE WITH STRAW BALES



PLAN

SECTION B–B

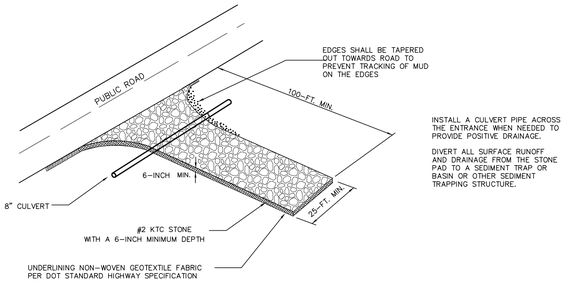
WASHOUT STRUCTURE WITH WOOD PLANKS

CONSTRUCTION SPECIFICATIONS

1. LOCATE WASHOUT STRUCTURE A MINIMUM OF 50 FEET AWAY FROM OPEN CHANNELS, STORM DRAIN INLETS, SENSITIVE AREAS, WETLANDS, BUFFERS AND WATER COURSES AND AWAY FROM CONSTRUCTION TRAFFIC.
2. SIZE WASHOUT STRUCTURE FOR VOLUME NECESSARY TO CONTAIN WASH WATER AND SOLIDS AND MAINTAIN AT LEAST 4 INCHES OF FREEBOARD. TYPICAL DIMENSIONS ARE 10 FEET X 10 FEET X 3 FEET DEEP.
3. PREPARE SOIL BASE FREE OF ROCKS OR OTHER DEBRIS THAT MAY CAUSE TEARS OR HOLES IN THE LINER. FOR LINER, USE 10 MIL OR THICKER UV RESISTANT, IMPERMEABLE SHEETING, FREE OF HOLES AND TEARS OR OTHER DEFECTS THAT COMPROMISE IMPERMEABILITY OF THE MATERIAL.
4. PROVIDE A SIGN FOR THE WASHOUT IN CLOSE PROXIMITY TO THE FACILITY.
5. KEEP CONCRETE WASHOUT STRUCTURE WATER TIGHT. REPLACE IMPERMEABLE LINER IF DAMAGED (E.G., RIPPED OR PUNCTURED). EMPTY OR REPLACE WASHOUT STRUCTURE THAT IS 75 PERCENT FULL, AND DISPOSE OF ACCUMULATED MATERIAL PROPERLY. DO NOT REUSE PLASTIC LINER. WET–VACUUM STORED LIQUIDS THAT HAVE NOT EVAPORATED AND DISPOSE OF IN AN APPROVED MANNER. PRIOR TO FORECASTED RAINSTORMS, REMOVE LIQUIDS OR COVER STRUCTURE TO PREVENT OVERFLOWS. REMOVE HARDENED SOLIDS, WHOLE OR BROKEN UP, FOR DISPOSAL OR RECYCLING. MAINTAIN RUNOFF DIVERSION AROUND EXCAVATED WASHOUT STRUCTURE UNTIL STRUCTURE IS REMOVED.

CONCRETE WASHOUT AREA (CWA)

N.T.S.



INSTALL A CULVERT PIPE ACROSS THE ENTRANCE WHEN NEEDED TO PROVIDE POSITIVE DRAINAGE.

DIVERT ALL SURFACE RUNOFF AND DRAINAGE FROM THE STONE PAD TO A SEDIMENT TRAP OR BASIN OR OTHER SEDIMENT TRAPPING STRUCTURE.

STABILIZED CONSTRUCTION ENTRANCE

WHEN AND WHERE TO USE IT

STABILIZED CONSTRUCTION ENTRANCES SHOULD BE USED AT ALL POINTS WHERE TRAFFIC WILL BE LEAVING A CONSTRUCTION SITE AND MOVING DIRECTLY ONTO A PUBLIC ROAD.

IMPORTANT CONSIDERATIONS

IF WASHING IS USED, PROVISIONS MUST BE MADE TO INTERCEPT THE WASH WATER AND TRAP THE SEDIMENT BEFORE IT IS CARRIED OFFSITE. WASHDOWN FACILITIES SHALL BE REQUIRED AS DIRECTED BY INSPECTOR AS NEEDED. WASHDOWN AREAS IN GENERAL MUST BE ESTABLISHED WITH CRUSHED GRAVEL AND DRAIN INTO A SEDIMENT TRAP OR SEDIMENT BASIN. CONSTRUCTION ENTRANCES SHOULD BE USED IN CONJUNCTION WITH THE STABILIZATION OF CONSTRUCTION ROADS TO REDUCE THE AMOUNT OF MUD PICKED UP BY VEHICLES.

UINSTALLATION:

REMOVE ALL VEGETATION AND ANY OBJECTIONABLE MATERIAL FROM THE FOUNDATION AREA.

DIVERT ALL SURFACE RUNOFF AND DRAINAGE FROM STONES TO A SEDIMENT TRAP OR BASIN.

INSTALL A NON–WOVEN GEOTEXTILE FABRIC PRIOR TO PLACING ANY STONE. INSTALL A CULVERT PIPE ACROSS THE ENTRANCE WHEN NEEDED TO PROVIDE POSITIVE DRAINAGE.

THE ENTRANCE SHALL CONSIST OF #2 KTC STONE PLACED AT A MINIMUM DEPTH OF 6–INCHES. MINIMUM DIMENSIONS OF THE ENTRANCE SHALL BE 24–FEET WIDE BY 100–FEET LONG, AND MAY BE MODIFIED AS NECESSARY TO ACCOMMODATE SITE CONSTRAINTS.

THE EDGES OF THE ENTRANCE SHALL BE TAPERED OUT TOWARDS THE ROAD TO PREVENT TRACKING OF MUD AT THE EDGE OF THE ENTRANCE.

INSPECTION AND MAINTENANCE:

INSPECT CONSTRUCTION ENTRANCES EVERY SEVEN (7) CALENDAR DAYS AND WITHIN 24–HOURS AFTER EACH RAINFALL EVENT THAT PRODUCES ½–INCHES OR MORE OF PRECIPITATION, OR AFTER HEAVY USE. CHECK FOR MUD AND SEDIMENT BUILDUP AND PAD INTEGRITY. MAKE DAILY INSPECTIONS DURING PERIODS OF WET WEATHER. MAINTENANCE IS REQUIRED MORE FREQUENTLY IN WET WEATHER CONDITIONS. RESHAPE THE STONE PAD AS NEEDED FOR DRAINAGE AND RUNOFF CONTROL.

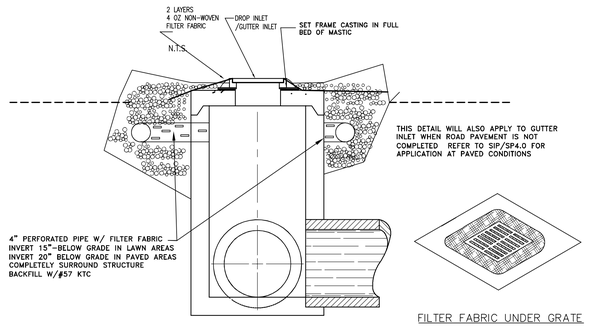
WASH OR REPLACE STONES AS NEEDED AND AS DIRECTED BY THE INSPECTOR. THE STONE IN THE ENTRANCE SHOULD BE WASHED OR REPLACED WHENEVER THE ENTRANCE FAILS TO REDUCE MUD BEING CARRIED OFF–SITE BY VEHICLES. FREQUENT WASHING WILL EXTEND THE USEFUL LIFE OF STONE.

IMMEDIATELY REMOVE MUD AND SEDIMENT TRACKED OR WASHED ONTO PUBLIC ROADS BY BRUSHING OR SWEEPING. FLUSHING SHOULD ONLY BE USED WHEN THE WATER CAN BE DISCHARGED TO A SEDIMENT TRAP OR BASIN.

REPAIR ANY BROKEN PAVEMENT IMMEDIATELY.

CONSTRUCTION ENTRANCE (CE)

N.T.S.



FILTER FABRIC UNDER GRATE

FILTER FABRIC INLET PROTECTION

USE FILTER FABRIC THAT CONFORMS TO DOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (LATEST EDITION).

INSTALLATION:

EXCAVATE A TRENCH 6–INCHES WIDE AND 6–INCHES DEEP AROUND THE OUTSIDE PERIMETER OF THE INLET UNLESS THE FABRIC IS PNEUMATICALLY INSTALLED.

INSTALL THE FILTER FABRIC TO A MINIMUM HEIGHT OF 24–INCHES ABOVE GRADE. SPACE THE POSTS AROUND THE PERIMETER OF THE INLET A MAXIMUM OF 3–FEET APART AND DRIVE THEM INTO THE GROUND A MINIMUM OF 24–INCHES.

CUT THE FILTER FABRIC FROM A CONTINUOUS ROLL TO THE LENGTH OF THE PROTECTED AREA TO AVOID THE USE OF JOINTS. WHEN JOINTS ARE NECESSARY, WRAP FILTER FABRIC TOGETHER ONLY AT A SUPPORT POST WITH BOTH ENDS SECURELY FASTENED TO THE POST, WITH A MINIMUM 6–INCH OVERLAP.

EXTEND THE FILTER FABRIC A MINIMUM OF 12–INCHES INTO THE TRENCH. BACKFILL THE TRENCH WITH SOIL OR CRUSHED STONE AND COMPACT OVER THE FILTER FABRIC UNLESS THE FABRIC IS PNEUMATICALLY INSTALLED.

ATTACH FABRIC TO STEEL POSTS WITH HEAVY–DUTY PLASTIC TIES. ATTACH AT LEAST FOUR (4) EVENLY SPACED TIES IN A MANNER TO PREVENT SAGGING OR TEARING OF THE FABRIC. IN ALL CASES, AFFIX TIES IN NO LESS THAN FOUR (4) PLACES.

INSPECTION AND MAINTENANCE:

INSPECTIONS SHOULD BE MADE EVERY 7 CALENDAR DAYS AND WITHIN 24–HOURS AFTER EACH STORM THAT PRODUCES ½–INCHES OR MORE OF RAIN. IF THE FABRIC BECOMES CLOGGED, IT SHOULD BE REPLACED. SEDIMENT SHOULD BE REMOVED WHEN IT REACHES APPROXIMATELY 1/3 THE HEIGHT OF THE FENCE.

TAKE CARE NOT TO DAMAGE OR UNDERCUT FABRIC WHEN REMOVING SEDIMENT. IF A SUMP IS USED, SEDIMENT SHOULD BE REMOVED WHEN IT FILLS APPROXIMATELY 1/3 THE DEPTH OF THE HOLE.MAINTAIN THE POOL AREA, ALWAYS PROVIDING ADEQUATE SEDIMENT STORAGE VOLUME FOR THE NEXT STORM.

STORM DRAIN INLET PROTECTION STRUCTURES SHOULD BE REMOVED ONLY AFTER THE DISTURBED AREAS ARE PERMANENTLY STABILIZED. REMOVE ALL CONSTRUCTION MATERIAL AND SEDIMENT, AND DISPOSE OF THEM PROPERLY. GRADE THE DISTURBED AREA TO THE ELEVATION OF THE DROP INLET STRUCTURE CREST. USE APPROPRIATE PERMANENT STABILIZATION METHODS TO STABILIZE BARE AREAS AROUND THE INLET.

FABRIC INLET PROTECTION (FIP)

N.T.S.

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY MICHAEL B. SASHKNES 19810 LICENSED PROFESSIONAL ARCHITECT

LEGRANDE ELEMENTARY ADDITION AND RENOVATIONON
HART COUNTY BOARD OF EDUCATION
70 LeGRANDE SCHOOL ROAD
HORSE CAVE, KENTUCKY 42749

SITE DETAILS

JOB NO.	2210
DATE	8/03/2023
DRAWN	MB
CHECKED	BKL

REVISIONS

No.	Description	Date

SHEET

SD4.1

X:\Projects\2022\2210_CORE\Esa\ARE\F\2210_30X42_RSHT.dwg
Date & Time: 8/3/2023 - 7:06pm
Login Name: mbaschkes
Sheet Layout: MODEL

STRUCTURAL QUALITY ASSURANCE PLAN

GENERAL

The new structure to be constructed is assigned by the Kentucky Building Code, 2018 Edition, to seismic use group and seismic design as specified. As such, the building code mandates special inspections (section 1704), special inspections for wind resistance (section 1705.11), special inspections for seismic resistance (section 1705.12), structural observations for seismic resistance (section 1704.6.1), and structural observations for wind requirements (section 1704.6.2). Structural quality assurance plan specifically identifies the responsibilities of the contractor and the special inspector in performing the required testing and inspection of the structural work.

CONTRACTOR RESPONSIBILITIES

In accordance with Section 1704.4 of the Building Code, the Contractor shall submit to the Building Official and the Architect a written statement of responsibility that contains the following:

1. Acknowledgement of awareness of the special requirements contained within this Structural Quality Assurance Plan.

2. Acknowledgement that control shall be exercised to obtain conformance with the construction documents approved by the Building Official.

3. Procedures for exercising control with the Contractor's organization, the method and frequency of reporting, and the distribution of reports.

4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

The Structural Testing / Inspection Agency that is to act as the Special Inspector will be hired by the Owner.

Contractor shall pay for any additional structural testing/inspection required for work or materials not complying with the Construction Documents due to negligence or nonconformance and shall pay for any additional structural testing/inspection required for his convenience.

The Contractor is responsible to ensure that the Special Inspector is present for all work requiring special inspection. Any work that requires special inspection and is performed without the Special Inspector being present is subject to being demolished and reconstructed.

The Contractor has the following responsibilities to the Special Inspector:

1. Provide copy of Construction Documents to the Special Inspector.

2. Notify the Special Inspector sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.

3. Cooperate with Special Inspector and provide access to work.

4. Provide samples of materials to be tested in required quantities.

5. Provide storage space for the Special Inspector's exclusive use, such as for storing and curing concrete testing samples.

6. Provide labor to assist the Special Inspector in performing tests/inspections.

SOILS

The Special Inspector shall perform the following:

1. Verify structural fill complies with specifications and the geotechnical report

2. Observer proofrolling.

3. Perform field density tests to verify compaction of structural fill. As a minimum, perform one test per lift for every 2500 square feet of fill placed.

CAST-IN-PLACE CONCRETE

The Contractor shall perform the following:

1. Establish concrete mix design proportions per ACI 318, Chapter 5. Submit (5) copies (paper) & (1) copy (digital) of the concrete mix designs. Include the following:

   a. Type and quantities of materials
   b. Slump
   c. Air content
   d. Fresh unit weight
   e. Aggregates sieve analysis
   f. Design compressive strength
   g. Location of placement in structure
   h. Method of placement
   i. Method of curing
   j. Seven-day and 28-day compressive strengths

2. Submit a certification from each manufacturer or supplier stating that materials meet the requirements of the specified ASTM and ACI standards.

3. Submit certification that the ready-mixed concrete plant complies with the requirements of the National Ready Mix Concrete Association.

The Special Inspector shall perform the following:

1. Verify quantity, location, and placement of reinforcing steel prior to concrete placement.

2. Examine concrete in truck to verify that concrete appears properly mixed.

3. Perform a slump test as deemed necessary for each concrete load. Record if water or admixtures are added to the concrete at the job site. Perform additional slump tests after job site adjustments.

4. Mold four specimens per set for compressive strength testing; one set for each 50 cubic yards (or portion thereof) of each mix design in any one day. For each set molded record:

   a. Slump
   b. Air content
   c. Unit weight
   d. Temperature, ambient and concrete
   e. Location of placement
   f. Any pertinent information, such as addition of water, addition of admixtures, etc.

5. Perform one 7-day and two 28-day compressive strength tests. (Use one as a spare to be broken as directed by the Structural Engineer if compressive strengths do not appear adequate.)

6. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, concrete design compressive strength, location of concrete placement in structure, concrete mix proportions and materials, compressive breaking strength and type of break.

NON-SHRINK GROUT UNDER STEEL BASE PLATES

The Special Inspector shall perform the following:

1. Compressive strength tests per ASTM C109.

2. Number of Tests: One test for each ten bags of grout used or minimum of one test for each day of grouting.

3. Cube Size: 2-inch x 2-inch.

4. Test Schedule: One cube at 3 days, two cubes at 7 days, three cubes at 28 days.

CONCRETE MASONRY

Contractor shall perform the following:

1. Submit a certification from each manufacturer or supplier stating that the following materials comply with the specified ASTM or ACI Standards:

   a. Concrete masonry units.
   b. Mortar materials: Portland cement, hydrated lime, and aggregates.
   c. Grout materials: Portland cement and aggregates.
   d. Joint reinforcement steel.
   e. Reinforcing steel.

2. For reinforcing steel used in concrete masonry walls, submit certified mill test reports.

Special Inspector shall perform the following:

1. Verify compressive strength of concrete masonry units, mortar, and coarse grout for every 5,000 sq. ft. of surface area (or portion thereof) as follows:

   a. Three (3) concrete masonry units shall be tested in accordance with ASTM C140.

   b. Six (6) mortar cube specimens shall be tested, three (3) at 7-days and three (3) at 28-days, in accordance with ASTM C109.

   c. Four (4) coarse grout specimens shall be tested, two (2) at 7-days and two (2) at 28-days, in accordance with ASTM C-109.

   d. In lieu of individual tests of masonry units, mortar, and grout, perform one (1) prism test (which consists of three prisms) in accordance with ASTM E447.

2. Provide continuous inspection to verify compliance of the following:

   a. Cleanliness of grout space prior to grouting.
   b. Placement of grout in reinforced cells.
   c. Preparation of required grout and mortar specimens.
   d. Welding of reinforcing bars.

3. Provide periodic inspection to verify compliance of the following:

   a. Proportions of site-prepared mortar or grout.
   b. Construction of mortar joints.
   c. Quantity, size, location, and support of reinforcing steel.
   d. Quantity, size, and placement of horizontal joint reinforcement.
   e. Type, size and location of anchors.
   f. Protection of masonry during cold or hot weather.

STRUCTURAL STEEL

The Contractor shall perform the following:

1. The steel fabricator shall be AISC or AWS Certified, refer to Spec. 05120.

2. Submit certified mill test reports for structural steel.

3. Submit manufacturer's certificate of compliance fro high-strength bolting and weld filler materials.

** If the fabricator is not certified, then the fabricator shall reimburse the owner for the costs of these tests.

The Special Inspector shall perform the following:

1. Provide continuous inspection to verify compliance of the following:

   a. Inspection of slip-critical connections, except periodic inspection may be performed when using torque control bolts (twist off)

   b. Complete and partial penetration groove welds. Ultrasonically inspect 100% of the complete penetration welds.

   c. Multi-pass fillet welds and single-pass fillet welds greater than 5/16".

2. Provide periodic inspection to verify compliance of the following:

   a. Material verification of high-strength bolts, nuts, and washers.
   b. Material verification of structural steel.
   c. Material verification of weld filler material.
   d. Anchor bolt size, configuration, and embedment shall be verified prior to placement of concrete.
   e. Visually inspect all field-welded connection. Visual inspection of welded joints includes periodic examination of fitup.
   f. Verify stud shear connector spacing and location. Visually inspect welding of stud shear connectors.

3. Weld Inspections

   a. Weld inspections shall be in accordance with AWS D1.1.
   b. Review and verify compliance of written welding procedures with AWS requirements.
   c. Verify that welding procedures are being adhered to during field welding.
   d. Verify welder qualifications.

   e. Use all means necessary to determine the quality of welds. The inspector may use gamma ray, magnaflux, trepanning, sonics or any other aid to visual inspection that the Special Inspector may deem necessary to be assured of the adequacy of the welding.

   f. Keep a systematic record of all welds that include, in addition to other required records, the identification marks of welders, a list of defective welds, and the manner of correcting defects.

4. Bolting inspection and testing shall be in accordance with AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts.

STEEL JOIST

The Contractor shall perform the following:

1. Joists shall be manufactured and designed in accordance with the Steel Joist Institute specifications. Submit letter of compliance.

2. Submit shop drawings from a SJI certified firm.

The Special Inspector shall perform periodic inspections of the following:

1. Visual inspection of bolted and welded connections.
2. Verify installation of bridging or braces.
3. Verify connection for top and bottom chords.
4. Verify reinforcement of members for concentrated loads.
5. Verify proper bearing.

STEEL DECK

The Contractor shall perform the following:

1. Submit mill certification that the supplied steel complies with the specifications.

The Special Inspector shall perform periodic inspections of the following:

1. Verify general alignment and deck lap.
2. Verify screws/welds for size and pattern.
3. Verify spacing and type of sidelap attachments.
4. Verify installation of deck closures.

SPECIAL INSPECTOR RESPONSIBILITIES

The Special Inspector shall maintain records of inspections in accordance with Section 1704.2.4 and shall distribute these records to the Architect and Structural Engineer on a weekly basis. At the conclusion of the project, the Special Inspector shall submit a final report including a written statement that the special inspections during construction have complied with this Structural Quality Assurance Plan and that any discrepancies noted during construction have been corrected.

SPECIAL INSPECTIONS PER CHAPTER 17 OF THE KENTUCKY BUILDING CODE

SECTION	ITEM	REQUIRED? YES	NO	REMARKS
1704.2.5	FABRICATORS	X		STEEL FABRICATION SPECIAL INSPECTION IS REQUIRED IF THE FABRICATOR IS NOT A.I.S.C. OR A.W.S. CERTIFIED.
1704.6.1	STRUCTURAL OBSERVATION FOR SEISMIC REQUIREMENTS		X	SEISMIC DESIGN CATEGORY 'C'
1704.6.2	STRUCTURAL OBSERVATION FOR WIND REQUIREMENTS		X	Vasd = 89mph.
1705.2	STEEL	X		PER AISC 360 & TABLE 1705.2.2
1705.3	CONCRETE	X		PER TABLE 1705.3
1705.4	MASONRY	X		LEVEL B TMS 402/ACI 530/ASCE 5 FOR MASONRY BEARING WALL FOUNDATIONS MEET EXCEPTION
1705.5	WOOD		X	PER SECTION 1705.5
1705.6	SOILS	X		PER SECTION 1705.6
1705.7	DRIVEN DEEP FOUNDATIONS		X	NONE
1705.8	CAST IN PLACE DEEP FOUNDATIONS		X	NONE
1705.9	HELICAL PILE FOUNDATIONS		X	NONE
1705.11.1	WIND - STRUCTURAL WOOD		X	Vasd OF 89MPH
1705.11.2	WIND - COLD FORMED STEEL FRAMING		X	Vasd OF 89MPH
1705.11.3	WIND - WIND RESISTING COMPONENTS		X	Vasd OF 89MPH
1705.12.1	SEISMIC - STRUCTURAL STEEL		X	SEISMIC DESIGN CATEGORY 'C'
1705.12.2	SEISMIC - STRUCTURAL WOOD		X	NONE
1705.12.3	SEISMIC - COLD FORMED STEEL FRAMING		X	NONE
1705.12.4	DESIGNATED SEISMIC SYSTEMS		X	SEISMIC DESIGN CATEGORY 'C'
1705.12.5	SEISMIC - ARCHITECTURAL COMPONENTS INTERIOR/EXTERIOR NON-LOAD BEARING WALLS AND VENEER IN STRUCTURES		X	SEISMIC DESIGN CATEGORY 'C'
1705.12.6	SEISMIC - MECHANICAL AND ELECTRICAL COMPONENTS		X	SEISMIC DESIGN CATEGORY 'C'
1705.12.7	SEISMIC - STORAGE RACKS AND ACCESS FLOORS		X	NONE
1705.14	SPRAYED FIREPROOFING		X	NONE
1705.15	MASTIC & INTUMESCENT FIREPROOFING		X	NONE
1705.16	E.I.F.S.		X	NONE
1705.17	FIRE RESISTANT PENETRATIONS & JOINTS		X	RISK CATEGORY II, NON-HIGH RISE
1705.18	SMOKE CONTROL		X	NONE

EARTHQUAKE DESIGN DATA

RISK CATEGORY	III
IMPORTANCE FACTOR	1.25
S_S	0.217
S_1	0.116
SITE CLASS	D
S_{DS}	0.231
S_{D1}	0.181
SEISMIC DESIGN CATEGORY	C
BASIC SEISMIC-FORCE RESISTING SYSTEM	ORDINARY REINFORCED MASONRY SHEAR WALLS
DESIGN BASE SHEAR	0.1447 x W (kips)
SEISMIC RESPONSE COEFFICIENT (C^S)	0.1447
RESPONSE MODIFICATION FACTOR	2
ANALYSIS PROCEDURE	ELFP

SNOW DESIGN DATA

GROUND SNOW LOAD (P_g)	15 PSF
MINIMUM SLOPED ROOF SNOW LOAD (P_m)	16.5 PSF
FLAT ROOF SNOW LOAD (P_f)	10.4 PSF
IMPORTANCE FACTOR	1.10
THERMAL FACTOR (C_t)	1.0
SNOW EXPOSURE FACTOR (C_e)	0.9

DESIGN LIVE LOADS

ROOF	20 PSF
FIRST FLOOR	100 PSF

WIND DESIGN DATA

ULTIMATE DESIGN WIND SPEED (Vult)		120 MPH
NOMINAL WIND SPEED (Vasd)		93 MPH
RISK CATEGORY		III
WIND PRESSURE CATEGORY		B
INTERNAL PRESSURE COEFFICIENT		+/- 0.18
COMPONENTS AND CLADDING [H<30 FT]		
	EXPOSURE B (PSF)	
ROOF 0 TO 7 DEGREES		
INTERIOR ZONE	10.5	-25.9
END ZONE	10.5	-43.5
CORNER ZONE	10.5	-65.4
ROOF >7 TO 27 DEGREES		
INTERIOR ZONE	14.9	-23.7
END ZONE	14.9	-41.3
CORNER ZONE	14.9	-61.0
ROOF >27 TO 45 DEGREES		
INTERIOR ZONE	23.7	-25.9
END ZONE	23.7	-30.3
CORNER ZONE	23.7	-30.3
WALLS		
INTERIOR ZONE	25.9	-28.1
END ZONE	25.9	-34.7

NOTE: NEGATIVE NUMBERS INDICATE A SUCTION/UPLIFT PRESSURE

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
BRIAN D SCOTT 32764
LICENSED PROFESSIONAL ENGINEER
8/3/2023

POAGE ENGINEERS & ASSOCIATES
880 Sharon Court, Suite 200
Lexington, KY 40504
Phone: (859) 253-5804
Fax: (859) 252-3180

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

STRUCTURAL NOTES

JOB NO.	23082
DATE	08.03.2023
DRAWN	HMM
CHECKED	BDS

REVISIONS

No.	Description	Date

SHEET

S0.0

GENERAL

1. Reference to standards or specifications of technical societies, organizations, or associations, or to codes of local/state authorities, means the latest standard, specification, or code adopted by the date shown on the Drawings, unless specifically noted otherwise.

2. Material, workmanship, and design shall conform to the referenced Building Code.

3. For dimensions not shown in the Structural Drawings, see the Architectural Drawings.

4. Contractor responsibilities include, but are not limited to, the following:

4.1 Coordinate the Structural Documents with the Architectural, Mechanical, Electrical, Plumbing, and Civil Documents. Architect/Structural Engineer shall be notified of any discrepancy or omission.

4.2 The structure is stable only in its completed form. Temporary supports required for stability during all intermediate stages of construction shall be designed, furnished, and installed by the Contractor.

4.3 Contractor has sole responsibility for job site safety and complying with all health and safety precautions as required by any regulatory agency. In performing construction observation visits to the job site, for the Contractor's means, methods, sequences, techniques, or procedures in performing the work.

5. Contractor shall field verify all existing conditions, elevations, and site conditions prior to construction and fabrication. Contractor shall immediately notify Structural Engineer of any existing conditions that are in conflict with the Structural Documents.

SUBMITTALS

1. Shop Drawings and Submittals
1.1 Reproduction of Structural Drawings for shop drawings is not permitted.
1.2 Electronic drawing files will not be provided to the Contractor.
1.3 Review of shop drawings will be for conformance with the Construction.

2. Submittals
Documents regarding arrangement and sizes of members and the Contractor's interpretation of the design loads, if applicable, and Construction Document details. Such review shall not relieve the Contractor of the full responsibility to comply with the Construction Documents.

2.1 The Structural Quality Assurance Plan and Specifications identify the required submittals. Prior to (or with) the first submittal, Contractor shall submit a list of all required submittals for Engineer's review.

3. Deferred Submittals

3.1 Deferred Submittals include those portions of the project that are furnished by the Contractor and designed by someone other than the Engineer of Record and are submitted at the time of the application. Deferred Submittals shall be submitted to the Building Official prior to fabrication and installation.

3.2 Submittal documents for Deferred Submittals:

3.2.1 Shall be included in the Contractor's scope of services and shall be sealed by an Engineer licensed in the project state. Design of Deferred Submittals shall be in accordance with the governing Building Code indicated above.

3.2.2 Shall be submitted to the registered design professional in responsible charge who shall review them and forward them to the Building Official with a notation indicating the deferred submittal documents have been reviewed and that they have been found in general conformance with the design of the building. Deferred submittal items shall not be installed until the design and submittal documents have been approved by the Building Official.

3.3 The following shall be considered Deferred Submittals:
Precast Slab Units

NOTE TO CONTRACTOR:

The contractor shall coordinate the Structural Drawings with the Architectural, Mechanical, and Electrical Drawings and make certain all pipes, sleeves, ducts, inserts, and openings are located and in place before each concrete pour.

The Contractor shall verify all dimensions shown on the Structural Drawings with dimensions shown on the Architectural Drawings. The Contractor shall check and approve, with reasonable promptness, shop drawings and schedules for coordination of details, sizes, fitting tolerances, and dimensions. The Contractor shall stamp or sign these drawings and schedules with his approval and then submit them to the Architect for review.

CONCRETE

1. All concrete shall conform and be designed, mixed, placed, tested, and cured in accordance with the provisions of the ACI Manual of Concrete Practice, (current edition). Special care shall be taken in curing floors, stairs, walls, and other exposed surfaces in accordance with the specifications.

2. All concrete shall develop 3,500 PSI compressive strength in 28 days.

a. W/C ratio, 0.45 for interior slabs and 0.46 for other concrete.

b. Flyash substitution is only permitted in slabs with a 15% max. content. Flyash substitution is NOT permitted in foundations.

c. Concrete structures and slabs exposed to freeze/thaw or subject to hydraulic pressure: air content 3% to 5%.

d. Other concrete, air content 2% to 4%

e. Slump limits (without a water reducer)
-Ramps & sloping surfaces: no more than 3"
-Reinforced foundations not less than 1" not more than 5"
-Other concrete not less than 1" not more than 5"

3. Dropping the concrete in excess of 10 feet, depositing in a large quantity at any point and running or working it along the forms, or any method tending to cause segregation or separation of the aggregates will not be permitted.

REINFORCEMENT STEEL

1. Reinforcement steel shall have a minimum yield strength of 60,000 PSI and conform with material specifications for reinforcing bars, ASTM A615 thru A617; see manual of standard practice, Concrete Reinforcing Steel Institute.

2. Welded wire fabric shall conform to ASTM A185.

3. All rebars shall be securely tied and held in place with a minimum concrete protection cover to all steel as follows:

Walls, Columns, Beams, and Pilasters	1 1/2"
Slabs	3/4"
Footings	3"

4. Reinforcing steel bends shall be made as per diagram, and/or in accordance with A.C.I. Code.

5. Lap all splices as specifically called for, but at least 38 bar diameters for bars less than or equal to #6, and 48 bar diameters, for bars greater than #6, (always 12 in. minimum) unless noted otherwise. Lap all splices in masonry reinforcement a minimum of 48 bar diameters.

FOUNDATION DESIGN

1. Foundations were designed using an assumed maximum earth bearing pressure of 2,000 PSF. The contractor shall verify that field conditions comply with these recommendations. This verification shall be performed by Licensed Geotechnical Engineer.

SHALLOW FOUNDATIONS ON SOIL

1. Any soils can lose strength if they become wet, so the foundation sub grades must be protected from exposure to water. Foundation construction the following procedures.

A. For soils that will remain exposed overnight or for an extended period of time, place a "lean" concrete mud-mat over the bearing areas. The concrete should be at least 4 inches thick. Flowable fill concrete or low-strength concrete is suitable for this cover, as conditions allow.

B. Disturbed soil must be removed prior to foundation concrete placement.

C. Foundation bearing conditions must be benched level.

D. Areas loosened by excavation operations must be recompacted prior to reinforcing steel placement.

E. Loose soil, debris, and excess surface water must be removed from the bearing surface prior to concrete placement.

F. The Special Inspector shall observe all foundation excavations and provide recommendations for treatment of any unsuitable conditions encountered.

G. The bearing conditions of foundation soils (stiff or better residual soil) shall be checked by means of portable dynamic cone penetration (DCP) testing at the direction of the special inspector.

GRADE SUPPORTED FLOOR SLABS

1. The following features are required as part of grade support slab construction:

A. Keep the crushed stone moist, but not wet, immediately prior to slab concrete placement to minimize curling of the slab due to differential curing conditions between the top and bottom of the slab.

B. The Special Inspector shall review the actual subgrade conditions prior to slab construction and to make recommendations for any unsuitable conditions encountered.

C. Slab subgrade conditions are also considered earthwork areas; thus, the recommendations contained in the Earthwork section of the report apply.

STRUCTURAL STEEL

1. Steel Shapes

1.1 W-Shapes: ASTM A992 (Grade 50)

1.2 Angles, Channels, Plates, UNO: ASTM A36

1.3 Square/Rectangular/Round Hollow Structural Sections (HSS): ASTM A500, Grade B

1.4 Structural steel exposed to weather shall be galvanized.

2. Anchor Rods, Bolts, and Studs

2.1 Anchor Rods: ASTM F1554, Grade 36. Headed Rods or threaded rods with plate washer and heavy hex nut.

2.2 All bolts for structural steel joint fasteners shall be 3/4"Ø high strength structural bolts, ASTM A325, Torque Control (Tension Set), unless otherwise noted.

3. Post-Installed Anchors: The procedure listed below are the design basis for these project. Installation of expansion anchors shall be in accordance with the ICC ES report and manufacturer's instructions for the particular anchor.

3.1 Expansion Anchors: Hilti Kwik Bolt TZ (ICC-ES ESR-1917), Simpson Strong-Tie Bolt 2 (ICC-ES ESR-3037), or Power-Stud+ SD2 (ICC_ES ESR-2502). Minimum embedment = 6 times anchor diameter, UNO.

3.2 Adhesive Anchors

3.2.1 All-thread steel anchor conforming to ASTM A307, Grade A or ASTM A36, zinc plated in accordance with ASTM B633.

3.2.2 Adhesive conforming to Hilti Hit RE 500 SD (ICC-ES AC308), Simpson SET-XP Epoxy-Tie (ICC-ES ESR-2508), or Powers PE1000+ Epoxy Adhesive (ICC-ES ESR-2583), or Powers AC100+ Gold Adhesive (ICC_ES ESR-2582). Minimum embedment = 6 times anchor diameter, UNO.

3.2.3 For hollow concrete masonry, use screen tube approved by manufacturer and an adhesive conforming to Simpson Strong-Tie SET (ICC-ES ESR-1772).

3.3 Screw Anchors: Simpson Titan-HD (Concrete: ICC-ES ESR-2713; Grouted Masonry: ICC-ES ESR-1056) or Powers Wedge-Bolt+ (ICC-ES ESR-2526). Minimum Embedment = 6 times anchor diameter, UNO.

3.4 Substitutions will only be considered for products have a code report recognizing the product for the appropriate application. The substitution request shall be accompanied by calculations that demonstrate the substituted product is capable of achieving the equivalent performance values of the design-basis product.

4. Structural steel shall be fabricated and erected according to the "Specification for Structural Steel Buildings" dated July 7, 2016 and the AISC "Code of Standard Practice for Steel Buildings and Bridges" dated June 15, 2016.

5. Connections shall be detailed based on the design information provided in the Structural Documents

5.1 Standard Shear Connections: Details as bolted or welded double-angle, sible-plate, single-angle, or tee connections in accordance with the connection tables in the "Manual of Steel Construction", Thirteenth Edition.

5.1.1 Shear connections not defined in the AISC Manual shall be designed by an Engineer licensed in the project state. This design service shall be included in the Contractor's scope of services. Shop drawings of such connections shall be sealed by the Engineer.

5.2 Factored Design Forces/Reactions: As shown on the Structural Drawings or, if not shown, the factored design reaction shall be half of the "Maximum Total Uniform Load (LRFD)" tabulated in the "Manual of Steel Construction", Thirteenth Edition.

5.3 Steel connections not specifically detailed in the Structural Drawings shall be designed by the Contractor. This design service shall be included in the Contractor's scope of services. Shop drawings of such connections shall be sealed by an Engineer licensed in the project state.

6. Shop Drawings: Submittal shall adequately depict structural members and connections.

7. All structural steel shall be fabricated and erected in accordance with the latest OSHA regulations regarding steel erection.

OPEN WEB STEEL JOIST

1. Only the standards of the Steel Joist Institute will be acceptable. The manufacturer's design and method of fabrication must have been checked by and be acceptable to the Steel Joist Institute.

2. Joist bridging shall be the size and spacing required by the Steel Joist Institute.

3. All open web steel joists shall be handled and erected in accordance with the Steel Joist Institute's recommendations.

4. All open web steel joists shall be handled and erected in accordance with the latest OSHA regulations regarding steel joists erection.

CONCRETE MASONRY

1. CMU Minimum Compressive Strength, fm = 1,500 psi.

2. Mortar: Walls below grade — Type M
Bearing Walls — Type M or S

3. Coarse Grout: 3,000 psi. min. compressive strength conforming to ASTM C476.

3.1 Grout solid bond beams, reinforced CMU cores, and CMU cores and wall cavities below grade.

3.2 Masonry webs on each side of grouted cells shall be fully mortared.

4. Horizontal Joint Reinforcement: Two (2) No. 9 gage longitudinal wires at 16" vertically U.N.O. Provide accessories for corners, intersections, etc.

5. Provide open bottom beam block units with 3" deep minimum web openings at horizontal reinforcement locations. A minimum clear space of one bar diameter shall be provided between the reinforcing bars and the face of masonry units.

6. CMU has been designed assuming "running bond" placement. Do no use "stack bond" unless approved by Structural Engineer.

7. Submit written construction procedures prior to the start of masonry construction.

8. No chases, risers, conduits, or toothing of masonry shall occur in masonry walls within 18 inches of beam bearing centerline.

9. Lap splices in reinforcing to be 48 bar diameters.

10. In addition to spacing indicated on plans, provide vertical bars at all corners, ends, jambs, intersections and both sides of control joints.

11. Extend all vertical reinforcement thru or into bond beams.

12. Provide dowels from supporting member (footing, beam, or slab) for all reinforced walls same size, location and spacing as wall reinforcing.

13. Vertical reinforcement shall be centered in cells of masonry unit, unless otherwise noted.

14. Bar positioners shall be used to hold vertical and bond beam reinforcement in proper alignment.

15. Vertical bars shall be held in position at top and bottom and at intervals not exceeding 200 bars diameters or 8 feet.

16. Grouting of masonry lintels over openings shall be accomplished in one continuous operation.

17. Grouting shall be stopped 1 1/2" below the top of a course to form a key at the pour joint.

18. Grout all cells of concrete masonry units below grade or slab.

19. Provide cleanout holes at least 3 inches in least dimension for grout pours over 5 feet in height.

A. At structurally reinforced walls provide cleanout holes at each structural vertical reinforcing bar.

B. Cleanout closures shall be braced to resist grout pressures.

20. See architectural drawings for locations of vertical control joints.

21. At vertical control joints, bond beam reinforcement and joint reinforcement shall be discontinuous. Provide two 3/4" diameter smooth dowels by 1'-4" across each control joint. Grease one end.

22. Special Inspections are required for the masonry construction on this project. The inspections include but are not limited to contiuous inspections during the grouting process. Refer to Chapter 17 of the Kentucky Building Code, current edition, for specific requirements.

SHERMAN CARTER BARNHART
ARCHITECTS

STATE OF KENTUCKY
BRIAN D SCOTT 32764
PROFESSIONAL ENGINEER
8/3/2023

POAGE ENGINEERS & ASSOCIATES
889 Sharkey Court, Suite 200
Bowling Green, KY 42103
Phone: (859) 252-5004
Fax: (859) 252-3180

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

STRUCTURAL NOTES

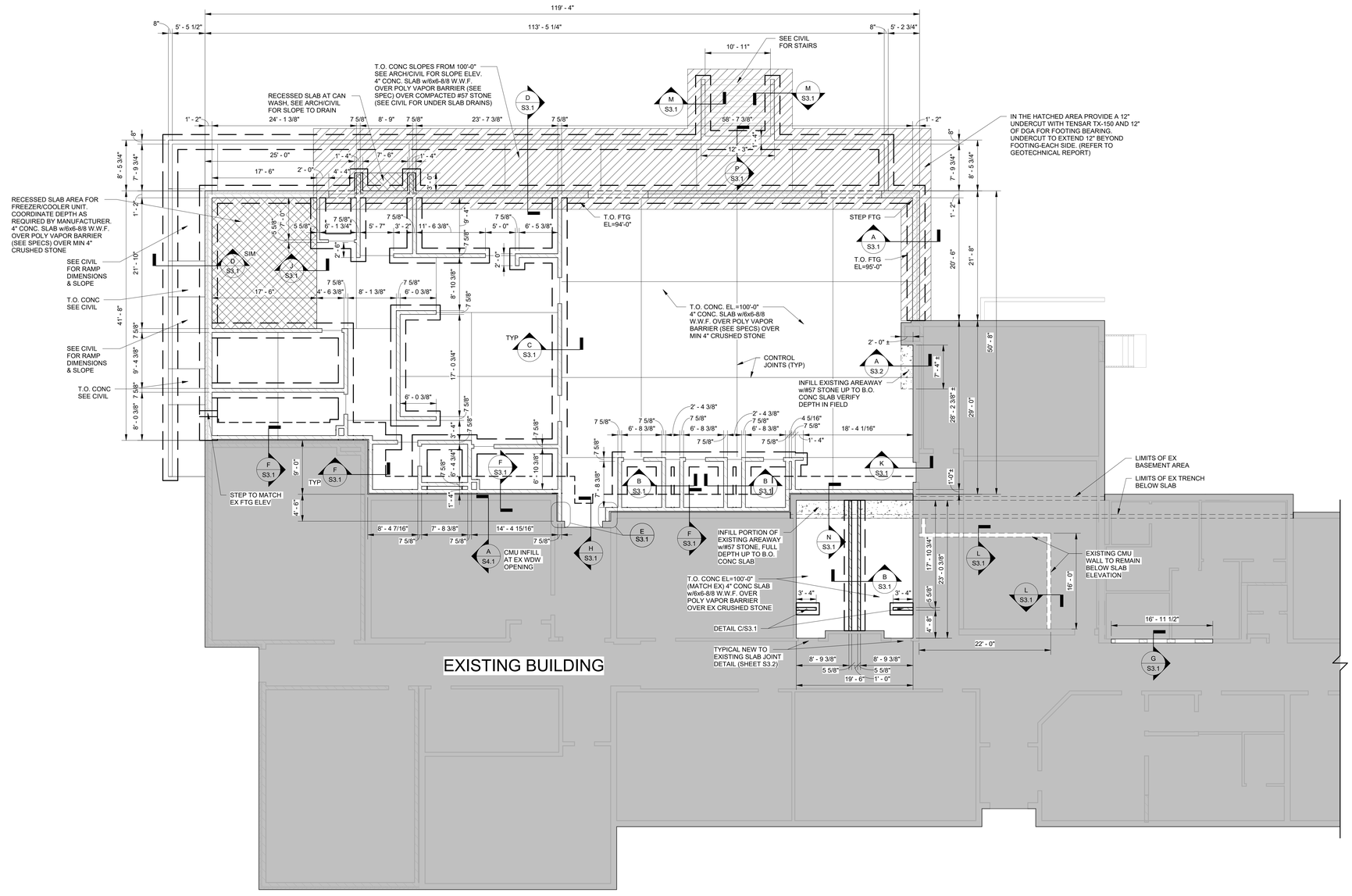
JOB NO.	23082
DATE	08.03.2023
DRAWN	HMM
CHECKED	BDS

REVISIONS

No.	Description	Date

SHEET

S0.1



FOUNDATION PLAN

NOTES:

1) DATUM ELEVATION = 100'-0" ASSUMED.
2) FILL ALL CMU CELLS & VOIDS BELOW FINISHED FLOOR OR GRADE W/CONCRETE GROUT.
3) REFER TO ARCH DWGS FOR LOCATIONS OF ALL INTERIOR NON-LOAD-BEARING WALLS NOT LOCATED ON STRUCTURAL DWGS.
4) TYPICAL BRICK SEAT AT EL=100'-0" COORDINATE LOCATION OF CONTROL JOINTS W/ARCH.
5) SAW CONTROL JOINTS IN THE CONCRETE SLAB IMMEDIATELY AFTER SET UP. REFER TO DWGS, BUT MAXIMUM SPACING SHALL BE 16'-0" IN EITHER DIRECTION (TYPICAL U.N.O.)
6) PROVIDE THICKENED SLAB UNDER ALL WALLS WITHOUT FOOTINGS SHOWN.
7) CONTRACTOR SHALL COORDINATE FLOOR DRAINS & DEPTHS W/ MECH & PLUMBING. REFER TO ARCH FOR REQUIRED FLOOR SLOPE.

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
BRIAN D SCOTT 42764 PROFESSIONAL ENGINEER
8/3/2023

POAGE ENGINEERS & ASSOCIATES
889 Sparta Court, Suite 200
Lexington, KY 40504
Phone: (859) 255-8004
Fax: (859) 252-3180

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

FOUNDATION PLAN

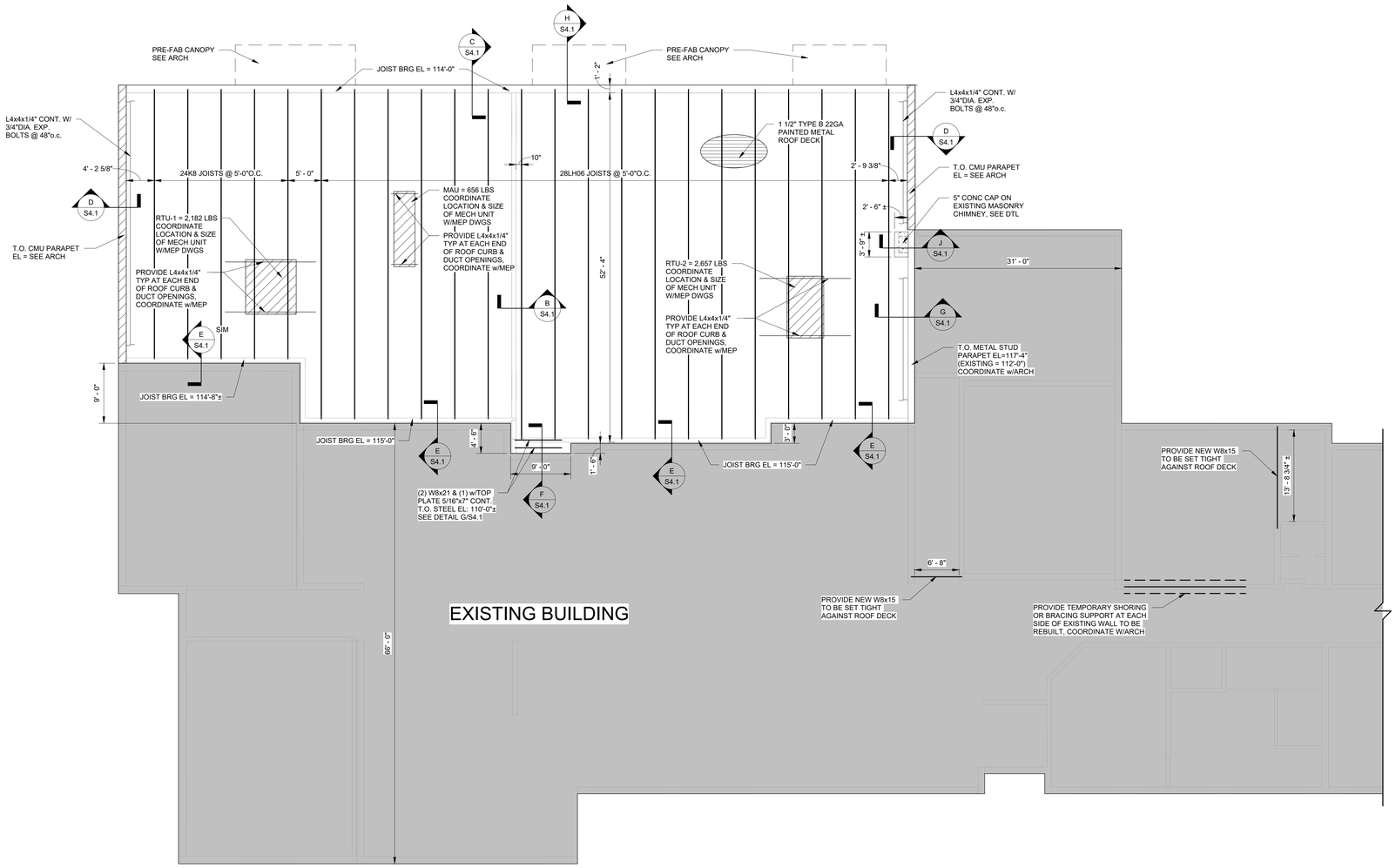
JOB NO.	23082
DATE	08.03.2023
DRAWN	HMM
CHECKED	BDS

REVISIONS

No.	Description	Date

SHEET

S1.1



ROOF FRAMING PLAN

NOTES:

1) MINIMUM JOIST SEAT IS 5" UNLESS OTHERWISE NOTED. BEARING ELEVATIONS AS NOTED ON FRAMING PLAN.

2) ADDITIONAL ROOF SLOPE AS NEEDED AT UPPER WALL STEPS IS TO BE PROVIDED WITH INSULATION MATERIALS. COORINATE WITH ARCHITECTURAL DRAWINGS.

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
BRIAN D SCOTT 32764
PROFESSIONAL ENGINEER
8/3/2023

POAGE ENGINEERS & ASSOCIATES
889 Sparta Court, Suite 200
Lexington, KY 40504
Phone: (859) 255-8004
Fax: (859) 252-3180

LEGRANDE ELEMENTARY SCHOOL
ADDITION AND RENOVATION
BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ROOF FRAMING PLAN

JOB NO.	23082
DATE	08.03.2023
DRAWN	HMM
CHECKED	BDS

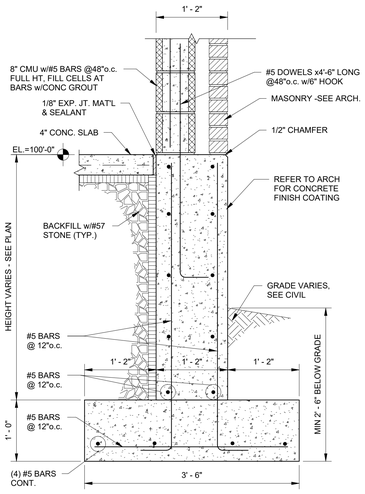
REVISIONS

No.	Description	Date

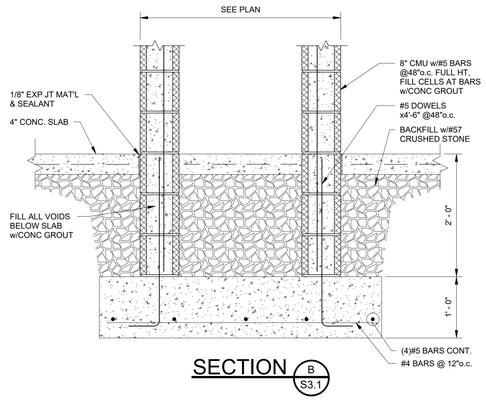
SHEET

S2.1

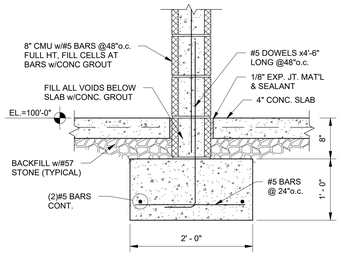
POAGE/23082/08.03.2023/HMM



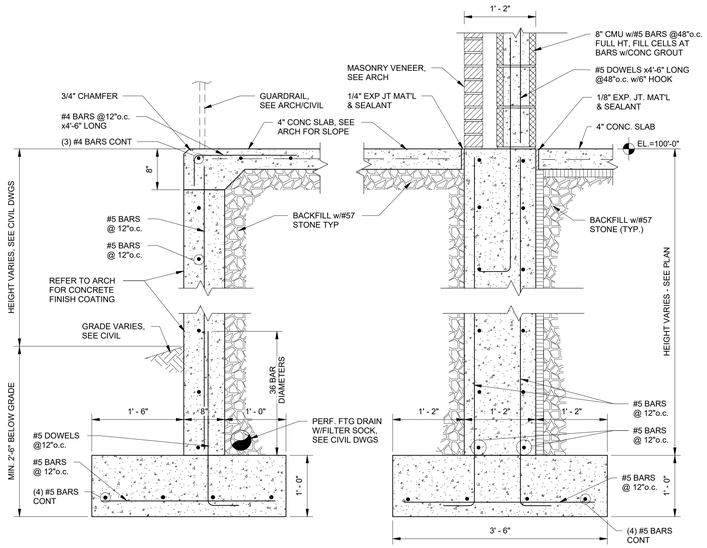
SECTION A S3.1



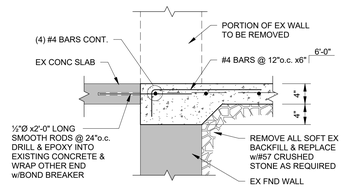
SECTION B S3.1



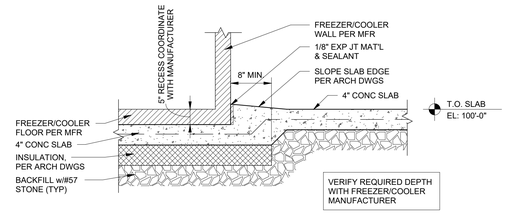
SECTION C S3.1



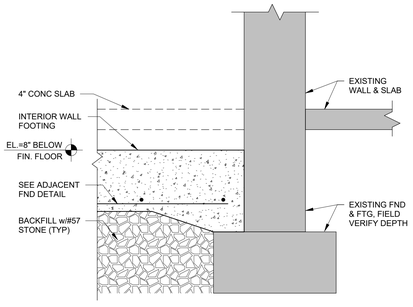
SECTION D S3.1



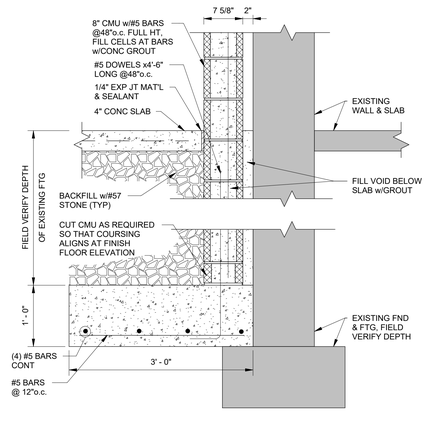
SECTION H S3.1



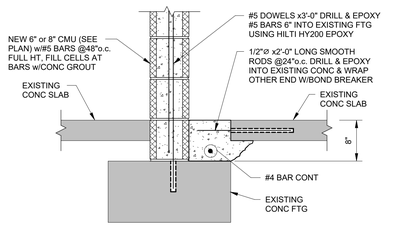
SECTION J S3.1



SECTION E S3.1



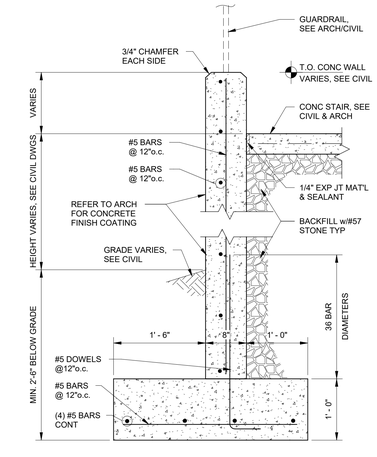
SECTION F S3.1



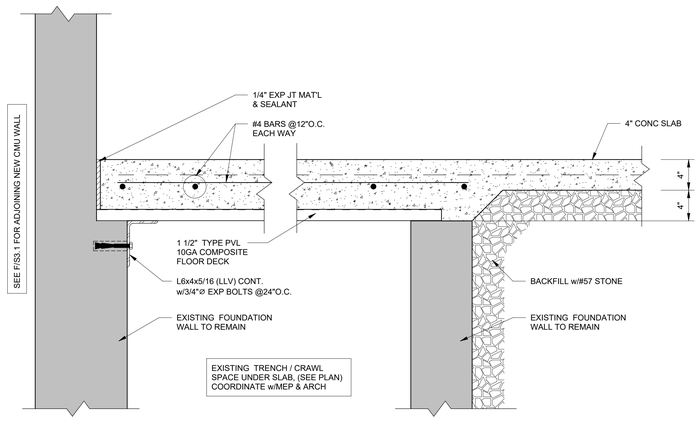
DETAIL G S3.1

SECTION K S3.1

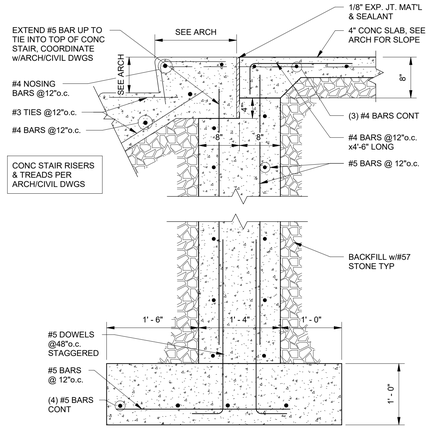
SECTION L S3.1



SECTION M S3.1



SECTION N S3.1



SECTION P S3.1

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
BRIAN D SCOTT 32764
PROFESSIONAL ENGINEER
8/3/2023

POAGE ENGINEERS & ASSOCIATES
889 Sparta Court, Suite 200
Lexington, KY 40504
Phone: (859) 255-8004
Fax: (859) 252-3180

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

SECTIONS & DETAILS

JOB NO.	23082
DATE	08.03.2023
DRAWN	HMM
CHECKED	BDS

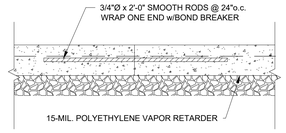
REVISIONS

No.	Description	Date

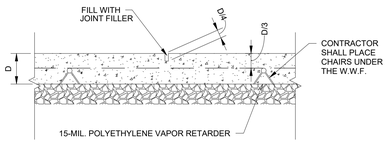
SHEET

S3.1

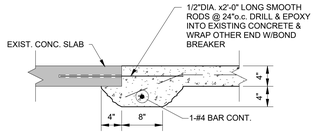
POAGE/23082/08.03.2023/HMM



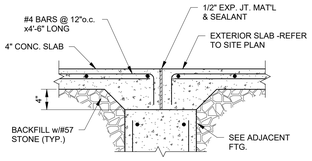
TYPICAL CONSTRUCTION JOINT DETAIL



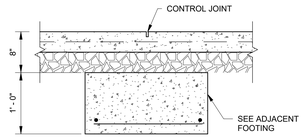
TYPICAL CONTROL JOINT DETAIL



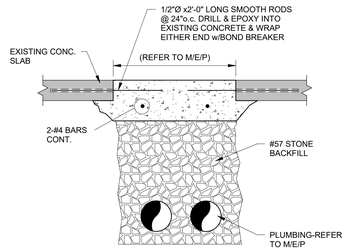
TYPICAL NEW TO EXISTING SLAB JOINT DETAIL



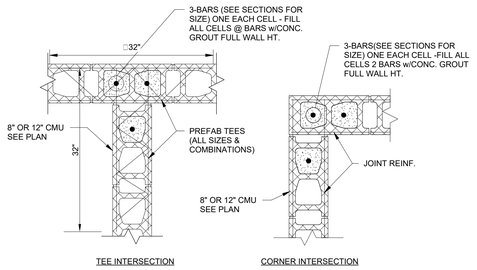
TYPICAL EXTERIOR DOOR OPENING DETAIL



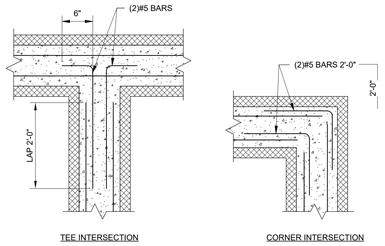
TYPICAL INTERIOR DOOR OPENING DETAIL



TYPICAL PLUMBING TRENCH REPAIR DETAIL

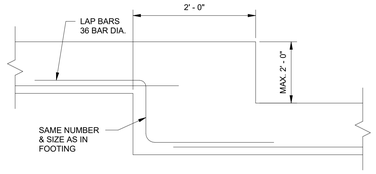


TYPICAL EXTERIOR CMU REINFORCEMENT DETAILS

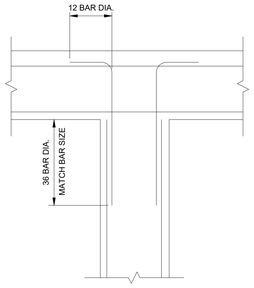


TYPICAL C.M.U. BOND BEAM REINFORCEMENT LAP DETAILS

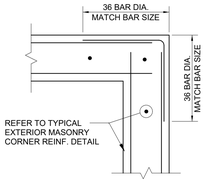
(12" BLOCK SHOWN - FOR 8" BLOCK 1-#5 BAR)



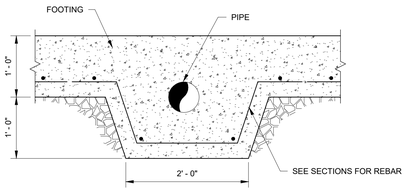
TYPICAL STEP FOOTING



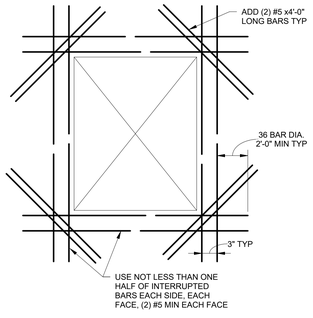
TYPICAL WALL INTERSECTION REINFORCING DETAIL



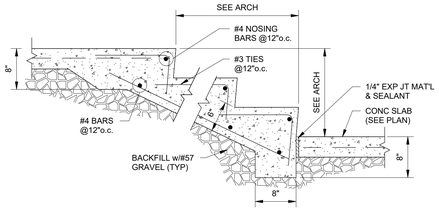
TYPICAL CORNER REINFORCING DETAIL



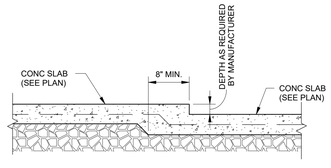
TYPICAL PIPE PERFORATION @ FOOTINGS



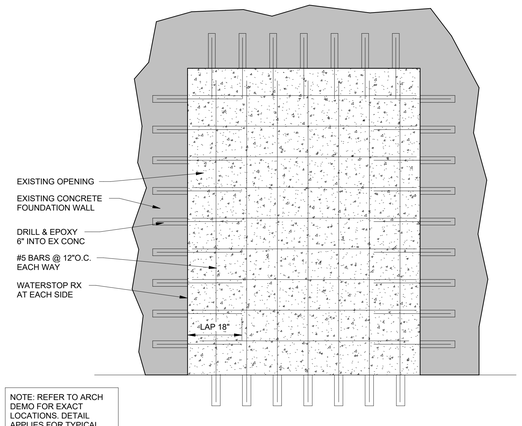
ADDITIONAL REINFORCMENT RECTANGULAR OPENINGS LARGER THAN 12"



TYPICAL CONCRETE STAIR REINFORCING DETAIL



TYPICAL RECESSED SLAB SECTION



NOTE: REFER TO ARCH DEMO FOR EXACT LOCATIONS. DETAIL APPLIES FOR TYPICAL INFILL OF EXISTING CONCRETE FOUNDATION WALL - ALL LOCATIONS.

TYPICAL CONCRETE INFILL AT EXISTING CONCRETE FOUNDATION WALL

A
S3.2

SHERMAN CARTER BARNHART
ARCHITECTS

STATE OF KENTUCKY
BRIAN D SCOTT
22764
PROFESSIONAL ENGINEER
8/3/2023

POAGE ENGINEERS & ASSOCIATES
880 Sharon Court, Suite 200
Lexington, KY 40504
Phone: (859) 255-8004
Fax: (859) 252-3180

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

SECTIONS & DETAILS

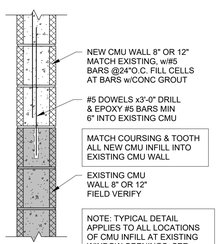
JOB NO.	23082
DATE	08.03.2023
DRAWN	HMM
CHECKED	BDS

REVISIONS

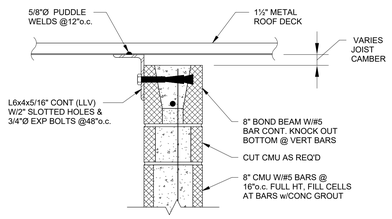
No.	Description	Date

SHEET

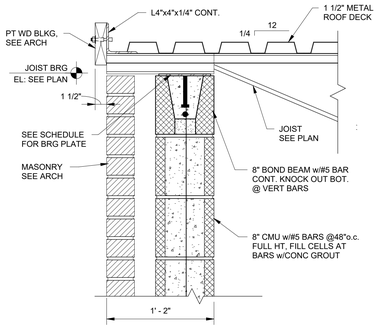
S3.2



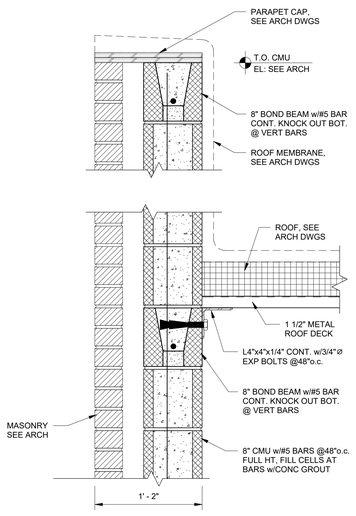
SECTION A S4.1



SECTION B S4.1

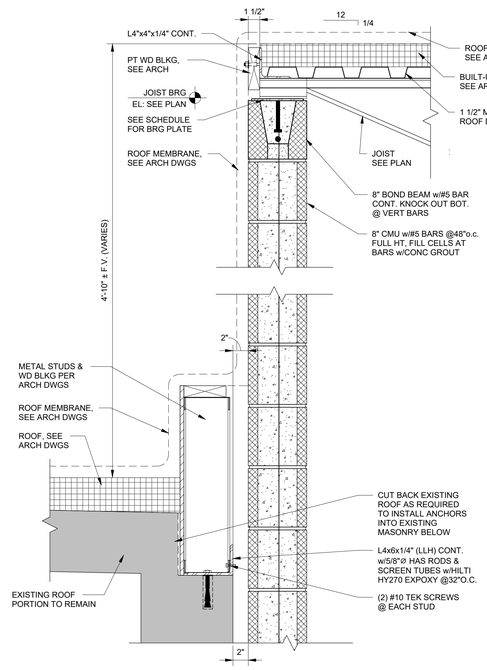


SECTION C S4.1

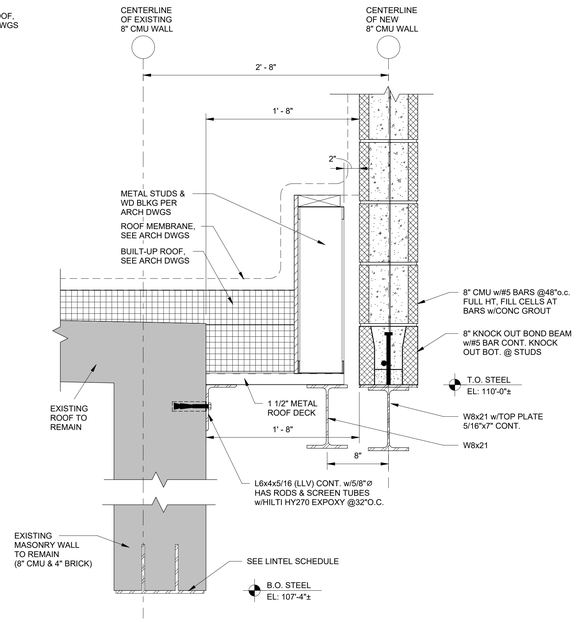


SECTION D S4.1

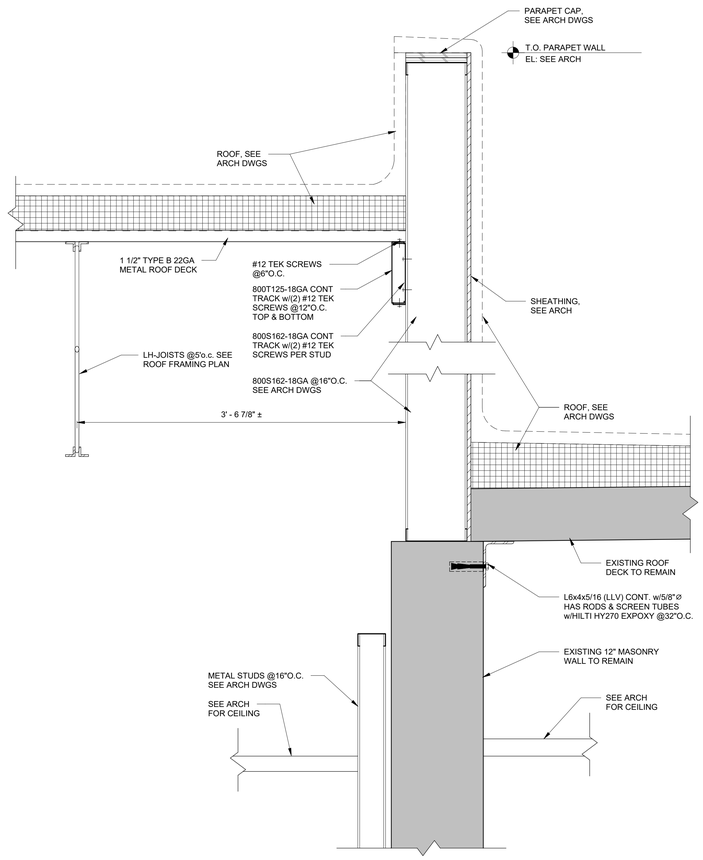
EL.= SLOPES



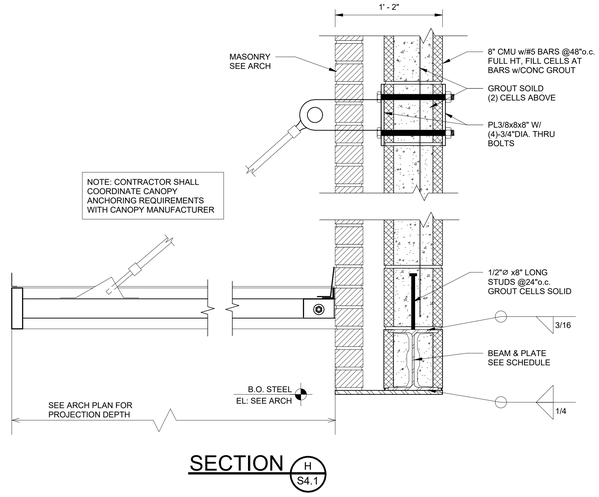
SECTION E S4.1



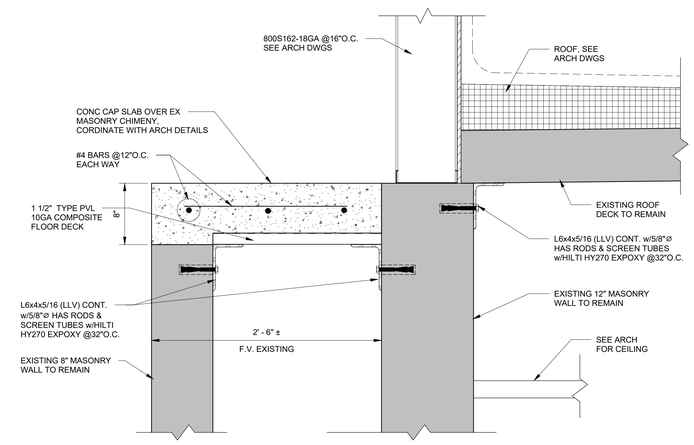
SECTION F S4.1



DETAIL G S4.1



SECTION H S4.1



SECTION J S4.1

POAGE2308\08.03.2023\HMM

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
BRIAN D SCOTT 32764
PROFESSIONAL ENGINEER
8/3/2023

POAGE ENGINEERS & ASSOCIATES
880 Sports Court, Suite 200
Bowling Green, KY 42104
Phone: (859) 252-5004
Fax: (859) 252-3180

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

SECTIONS & DETAILS

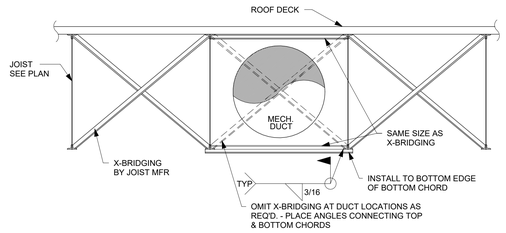
JOB NO.	23082
DATE	08.03.2023
DRAWN	HMM
CHECKED	BDS

REVISIONS

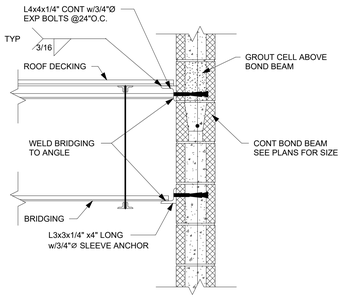
No.	Description	Date

SHEET

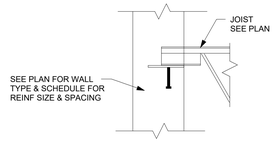
S4.1



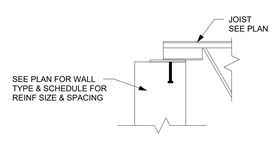
JOIST X-BRIDGING MODIFICATION AT MECH DUCT LOCATIONS



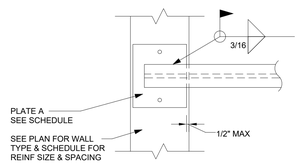
TYPICAL JOIST BRIDGING AT CMU WALL DETAIL

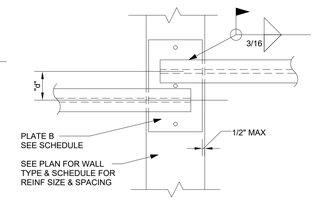


CONDITION 1
BRG BELOW T.O.W.



CONDITION 2
BRG @ T.O.W.





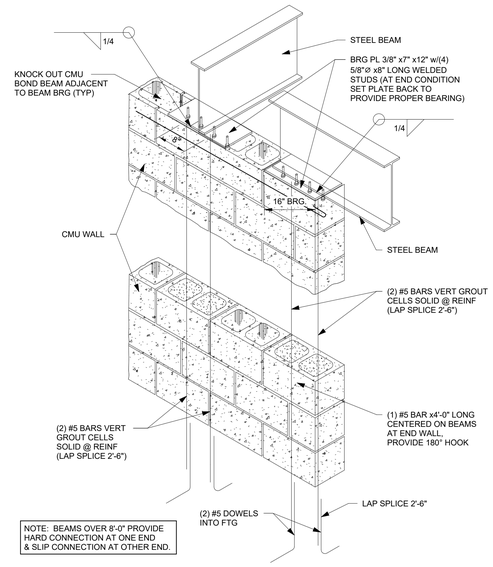
BEARING PLATE SCHEDULE

CONDITION 1

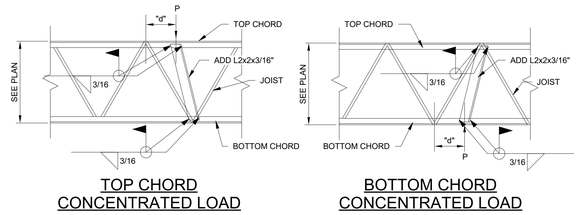
	K-SERIES			LH-SERIES		
	PLATE A	PLATE B	d	PLATE A	PLATE B	d
8" CMU	BRG PL 1/4" x7" x7" w/(2) 1/2"Ø x4" LONG NELSON STUDS			BRG PL 1/4" x6" x9" w/(3) 1/2"Ø x4" LONG NELSON STUDS		

CONDITION 2

	K-SERIES			LH-SERIES		
	PLATE A	PLATE B	d	PLATE A	PLATE B	d
8" CMU	BRG PL 1/4" x7" x7" w/(2) 1/2"Ø x4" LONG NELSON STUDS	BRG PL 1/4" x7" x14" w/(3) 1/2"Ø x4" LONG NELSON STUDS	6"	BRG PL 1/4" x6" x9" w/(3) 1/2"Ø x4" LONG NELSON STUDS	BRG PL 1/4" x7" x18" w/(4) 1/2"Ø x4" LONG NELSON STUDS	6"



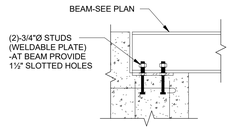
TYPICAL BEAM BEARING AT CMU WALL



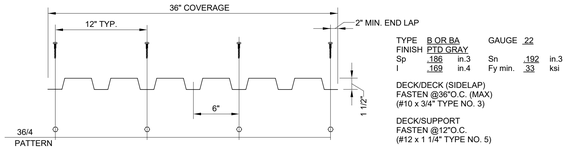
TOP CHORD CONCENTRATED LOAD

BOTTOM CHORD CONCENTRATED LOAD

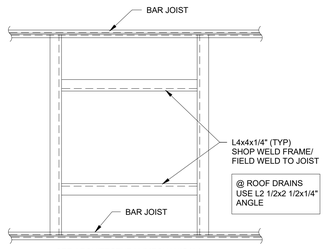
REINFORCING REQUIRED AT ALL CONCENTRATED LOADS



TYPICAL BEAM BEARING w/SLIP CONNECTION



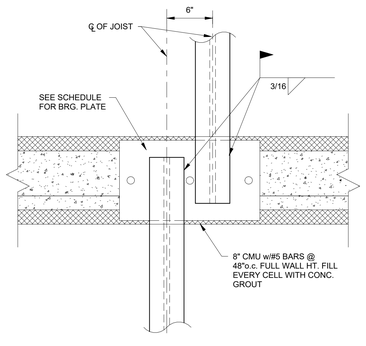
TYPICAL ROOF DECK ATTACHMENT



SEE ARCHITECTURAL/MECHANICAL/ ELECTRICAL FOR ALL OPENINGS

TYPICAL ROOF OPENING

(FOR ALL OPENINGS GREATER THAN 12")
(INCLUDES BUT IS NOT LIMITED TO ROOF DRAINS)



TYPICAL JOIST BEARING PLATE AT CMU BOND BEAM DETAIL

LINTEL SCHEDULE: NEW AND EXISTING WALLS

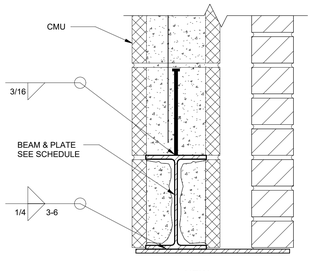
OPENING	4" BRICK		4" BLOCK		6" BLOCK		8" BLOCK* EXISTING		8" BLOCK		12" BLOCK EXISTING		12" BLOCK		8" BLOCK & 4" BRICK EXISTING		8" BLOCK & 4" BRICK		12" BLOCK & 4" BRICK		4" BLOCK & 12" BLOCK & 4" BRICK	
	SIZE	SHAPE	SIZE	SHAPE	SIZE	SHAPE	SIZE	SHAPE	SIZE	SHAPE	SIZE	SHAPE	SIZE	SHAPE	SIZE	SHAPE	SIZE	SHAPE	SIZE	SHAPE	SIZE	SHAPE
0 TO 4'-0"	L 3 1/2" x3 1/2" x1/4"	L	PL 1/4" x3 1/2" (H) PL 1/4" x3" (V)	⊥	8" BOND BEAM w/#5 BAR		PL 1/4" x7" (H) PL 1/4" x4" (V)	⊥	8" BOND BEAM w/#5 BAR		PL 5/16" x11 1/2" (H) PL 5/16" x8" (V)	⊥	8" BOND BEAM w/(2) #5 BARS		PL 5/16" x11 1/2" (H) (2) PL 5/16" x6" (V)	⊥	L 3 1/2" x3 1/2" x1/4" & 8" BOND BEAM w/#5 BAR		L 3 1/2" x3 1/2" x1/4" & 8" BOND BEAM w/(2) #5 BARS		(2) L 3 1/2" x3 1/2" x1/4" & 8" BOND BEAM w/(2) #5 BARS	
4'-1" TO 6'-0"	L 4" x3 1/2" x1/4"	L	PL 5/16" x3 1/2" (H) PL 5/16" x4" (V)	⊥	W8x10 w/PL 1/4" x5 1/4"	I	PL 5/16" x7" (H) PL 5/16" x6" (V)	⊥	16" BOND BEAM w/(2) #5 BARS		PL 3/8" x 11" (H) PL 3/8" x8" (V)	⊥	16" BOND BEAM w/(2) #5 BARS		PL 3/8" x11 1/2" (H) (2) PL 3/8" x6" (V)	⊥	L 4" x3 1/2" x1/4" & 16" BOND BEAM w/(2) #5 BARS		L 4" x3 1/2" x1/4" & 16" BOND BEAM w/(2) #5 BARS		(2) L 4" x3 1/2" x1/4" & 16" BOND BEAM w/(2) #5 BARS	
6'-1" TO 8'-0"	L 5" x3 1/2" x5/16"	L	PL 3/8" x3 1/2" (H) PL 3/8" x4" (V)	⊥	W8x13 w/PL 1/4" x5 1/4"	I	W8x18 w/PL 1/4" x7"	I	W8x15 w/PL 1/4" x7"	I	W8x18 w/PL 5/16" x11"	I	W8x15 w/PL 5/16" x11"	I	W8x21 w/PL 5/16" x13"	I	W8x18 w/PL 5/16" x13"	I	W8x24 w/PL 3/8" x17"	I	W8x21 w/PL 5/16" x20"	I
8'-1" TO 10'-0"					W8x15 w/PL 1/4" x5 1/4"	I	W8x21 w/PL 5/16" x7"	I	W8x18 w/PL 5/16" x7"	I	W8x21 w/PL 5/16" x11"	I	W8x18 w/PL 5/16" x11"	I	W8x24 w/PL 5/16" x13"	I	W8x21 w/PL 5/16" x13"	I	W8x28 w/PL 3/8" x17"	I	W8x24 w/PL 3/8" x20"	I
10'-1" TO 12'-0"							W8x24 w/PL 5/16" x7"	I	W8x21 w/PL 5/16" x7"	I	W8x24 w/PL 5/16" x11"	I	W8x21 w/PL 5/16" x11"	I	W8x28 w/PL 3/8" x13"	I	W8x24 w/PL 3/8" x13"	I	W8x31 w/PL 3/8" x17"	I	W8x24 w/PL 3/8" x20"	I
12'-1" TO 14'-0"							W8x24 w/PL 5/16" x7"	I	W8x24 w/PL 5/16" x7"	I	W8x28 w/PL 3/8" x11"	I	W8x24 w/PL 3/8" x11"	I	W8x31 w/PL 3/8" x13"	I	W8x24 w/PL 3/8" x13"	I	W8x35 w/PL 3/8" x17"	I	W8x28 w/PL 3/8" x20"	I
14'-1" TO 16'-0"							W8x28 w/PL 5/16" x7"	I	W8x28 w/PL 5/16" x7"	I	W8x31 w/PL 3/8" x11"	I	W8x28 w/PL 3/8" x11"	I	W8x35 w/PL 3/8" x13"	I	W8x28 w/PL 3/8" x13"	I	W8x40 w/PL 3/8" x17"	I	W8x31 w/PL 3/8" x20"	I

*OR (2) 4" CMU WALLS

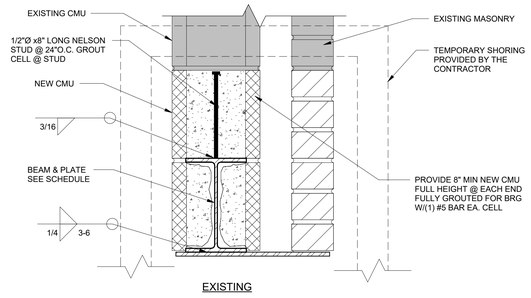
NOTES:

1. THIS LINTEL SCHEDULE APPILES TO ALL MASONRY OPENINGS SHOWN ON THE ARCHITECTURAL, MECHANICAL, ELECTRICAL, & PLUMBING DRAWINGS. THE CONTRACTOR SHALL REVIEW ALL DRAWINGS & PROVIDE ALL NECESSARY STEEL LINTELS & MISCELLANEOUS FRAMING REQUIRED TO COMPLETE THE PROJECT WHETHER SHOWN ON THIS LINTEL SCHEDULE OR NOT.
2. AT EXTERIOR WALL CONDITIONS, ONLY THE STEEL PLATE SHALL BE GALVANIZED, PROVIDED THE STEEL BEAM IS NOT EXPOSED.
3. IF THE LINTEL OCCURS AT A CORNER, THE STEEL PLATE SHALL BE EXTENDED TO A MITERED CORNER.
4. ALL LINTEL BEAMS OVER MASONRY OPENINGS SPANNING GREATER THAN 6'-0" SHALL HAVE NELSON STUDS. REFER TO TYPICAL LINTEL BEAM DETAIL.
5. ALL LINTEL BEAMS SPANNING GREATER THAN 8'-0" SHALL HAVE BEARING PLATES AND THE BOTTOM PLATE SHALL EXTEND FULL BEAM LENGTH. REFER TO TYPICAL BEAM BEARING DETAIL.
6. PLATE WIDTH MAY VARY FROM STANDARD SIZES SHOWN. CONTRACTOR SHALL VERIFY SIZE SO THAT WIDTH = WALL THICKNESS -1".
7. IN LOCATIONS WHERE BOND BEAMS WILL ATTACH TO STEEL COLUMNS, THE CONTRACTOR SHALL SUBSTITUTE A STEEL BEAM & PLATE. REFER TO LINTEL SCHEDULE ABOVE FOR THE NEXT AVAILABLE SIZE.
8. THIS SCHEDULE APPLIES TO MASONRY OPENINGS REQUIRED BY SOFFITS OR RECESSED DOOR OPENINGS SHOWN ON ARCHITECTURAL DRAWINGS UNLESS SHOWN ON THE STRUCTURAL DRAWINGS.
9. ALL LINTELS SHALL BEAR A MINIMUM OF 8" ON CMU. BEARING ON BRICK VENEER DOES NOT COUNT TOWARDS THE MINIMUM BEARING REQUIREMENTS.
10. REFER TO ARCHITECTURAL DEMOLITION PLANS FOR NEW OPENINGS IN EXISTING WALLS.

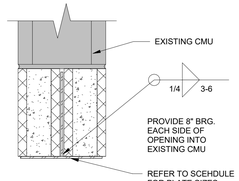
TYPICAL LINTEL BEAM DETAILS



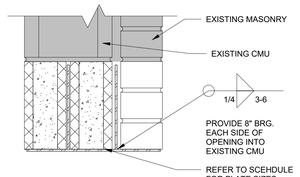
NEW



EXISTING



EXISTING



EXISTING

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
BRIAN D SCOTT 32764
PROFESSIONAL ENGINEER
8/3/2023

POAGE ENGINEERS & ASSOCIATES
880 Sharon Court, Suite 200
Lexington, KY 40504
Phone: (859) 252-5004
Fax: (859) 252-3180

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

SECTIONS & DETAILS

JOB NO.	23082
DATE	08.03.2023
DRAWN	HMM
CHECKED	BDS

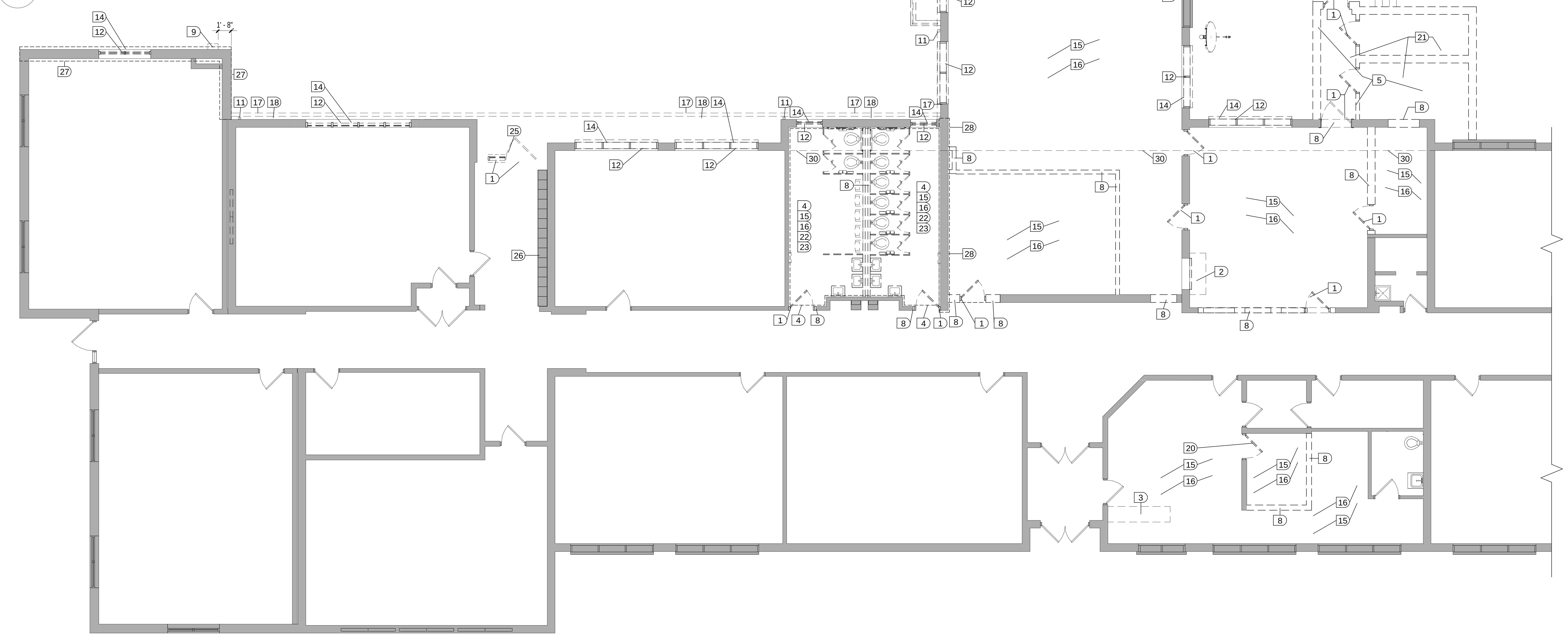
REVISIONS

No.	Description	Date

SHEET

S4.2

8 Existing Photo - G
1/4" = 1'-0"



PLAN NORTH

1 DEMOLITION PLAN
1/8" = 1'-0"

6 Existing Photo - E
NTS

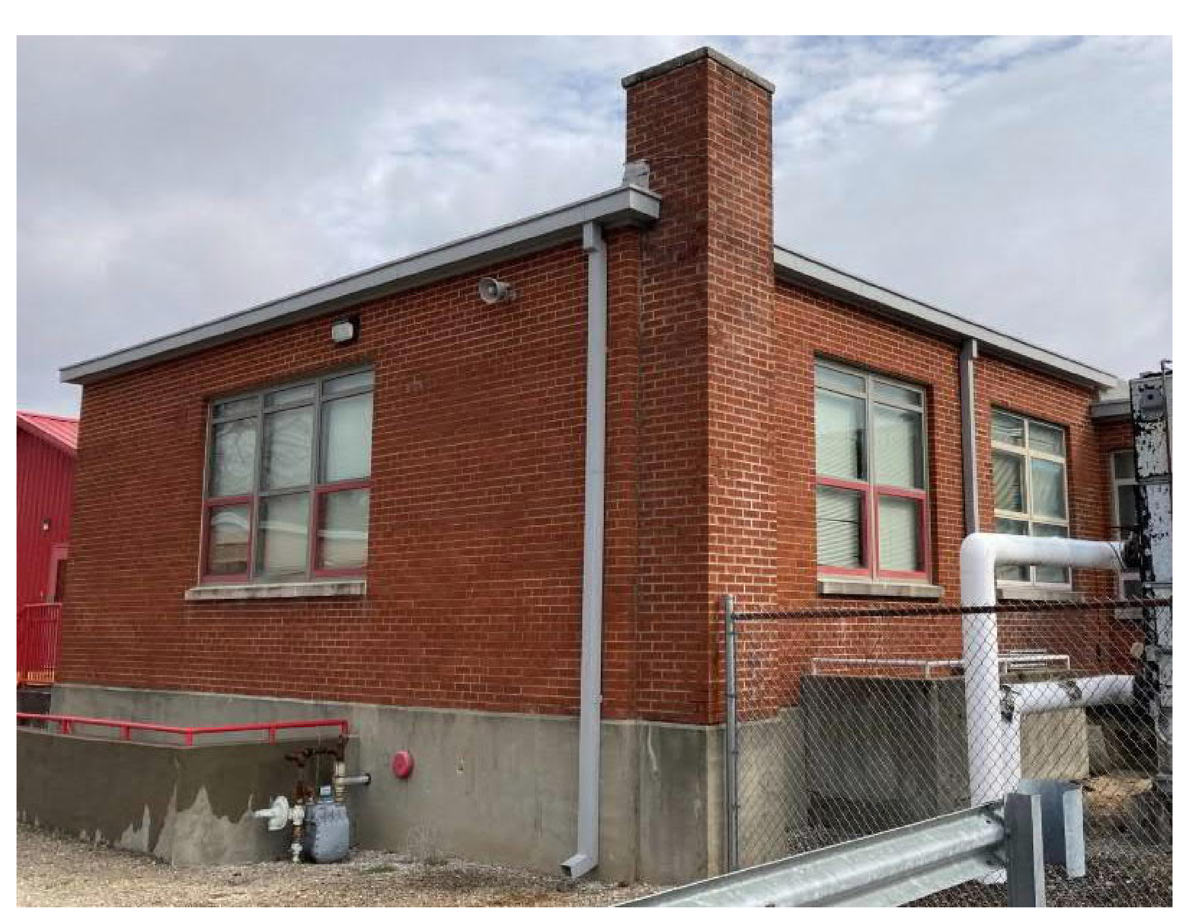
4 Existing Photo - C
NTS

REFER TO MPE TYP

3 Existing Photo - B
NTS

2 Existing Photo - A
NTS

7 Existing Photo - F
NTS



5 Existing Photo - D
NTS

DEMOLITION KEYNOTES

(X)

NOTE: SEQUENCE OF DEMOLITION WILL BE AFFECTED BY REQUIRED PROJECT PHASING . THE CONTRACTOR IS RESPONSIBLE TO COORDINATE ALL WORK FOR MINIMAL DISRUPTION TO THE OWNER AND THE NORMAL USE OF THE BUILDING. SEE PHASING NOTES THIS SHEET.

NOTE: ALL KEYNOTES MAY NOT APPLY TO THIS SHEET.

1. DOOR/ FRAME/ HARDWARE ASSEMBLYTO BE REMOVED
2. ROLL-UP SHUTTER ASSEMBLY TO BE REMOVED.
3. RECEPTION COUNTER AND WALL TO BE REMOVED.
4. CONCRETE SLAB TO BE REMOVED. SAW CUT EDGE OF SLAB TO REMAIN.
5. METAL BUILDING ADDITION ASSEMBLY (STRUCTURE, SYSTEMS AND FINISHES) TO BE REMOVED ENTIRELY. SELECTIVELY DEMOLISH TO PROTECT ADJACENT CONSTRUCTION TO REMAIN. MAINTAIN A WATERTIGHT AND SECURE BUILDING ENVELOPE.
6. STOOP, STEPS AND RAILING ASSEMBLY TO BE REMOVED.
7. AREAWAY / STEPS / RAILING ASSEMBLY TO REMAIN, PROTECT.
8. WALL TO BE REMOVED AS REQUIRED FOR NEW OPENING. WHERE WALLS ARE BEING REMOVED ENTIRELY OR AT NEW DOOR OPENINGS REMOVE WALL TO 8" BELOW FINISHED FLOOR. WHERE WALLS ARE BEING REMOVED AND BEING REBUILT IN THE SAME PLACE, REMOVE WALL TO FINISH FLOOR.
9. CONDUCTOR HEAD, DOWNSPOUT AND SPLASHBLOCK TO BE REMOVED.
10. SELECT DEMOLISH TOP PORTION OF CHIMNEY AND FLUE ASSEMBLY TO 8" BELOW ROOF. PROVIDE TEMPORARY WEATHERTIGHT CAP.
11. DOWNSPOUT AND SPLASHBLOCK TO BE REMOVED.
12. REMOVE WINDOW, STONE SILL AND TRIM COMPLETELY, PREPARE OPENING FOR NEW WORK.
13. CONCRETE STEPS & RAILINGS TO REMAIN, PROTECT.
14. SALVAGE EXISTING STONE WINDOW SILLS. DELIVER SURPLUS MATERIAL TO OWNER'S IN COUNTY STORAGE FACILITY.
15. CEILING ASSEMBLY TO BE REMOVED.
16. FLOORING AND BASE TO BE REMOVED. PROTECT ADJACENT FLOORING TO REMAIN. PREPARE SURACES FOR NEW WORK.
17. GUTTER ASSEMBLY TO BE REMOVED.
18. ROOF OVERHANG TO BE SECELECTIVLY DEMOLISHED TO ALIGN WITH EXTERIOR FACE OF WALLS BELOW.
19. CONCRETE AREAWAY ASSEMBLY TO BE REMOVED. REFER ALSO TO MECHANICAL.
20. DOOR AND HARDWARE TO BE REMOVED. FRAME TO REMAIN. PROTECT.
21. REMOVE SLABS/FOOTINGS/WALLS/ROOF OF EXISTING COOLER/FREEZER/CORRIDOR CONSTRUCTION.
22. TOILET PARTITIONS TO BE REMOVED.
23. TOILET ACCESSORIES TO BE REMOVED.
24. GAS METER TO REMAIN, PROTECT.
25. REMOVE STOOP. SAW CUT EDGE AT EXISTING TO REMAIN.
26. EXISTING LOCKERS TO REMAIN. PROTECT.
27. REMOVE METAL COPING AT PARAPET ABOVE. REFER TO ROOF PLAN , SHEET A1.3.
28. REMOVE SPRAY FOAM ROOFING, GUTTER AND DOWNSPOUT. REFER TO ROOF PLAN, SHEET A1.3.
29. REFER TO MEP FOR LOUVER REMOVAL IN BASEMENT. REFER ALSO TO STRUCTURAL FOR INFILL OF FORMER LOUVER OPENING.
30. EDGE OF BASEMENT BELOW. SHORE/BRACE BASEMENT DECKING AND WALLS AS REQUIRED.

HAZARDOUS MATERIAL NOTES

DUE TO THE AGE OF THE EXISTING BUILDING, IT IS POSSIBLE HAZARDOUS MATERIALS MAY EXIST, INCLUDING, BUT NOT LIMITED TO ASBESTOS PRODUCTS, POLYCHLORINATED BIPHENYL (PCB) AND OTHER TOXIC SUBSTANCES. IF ANY WORK PERSON ENCOUNTERS ANY MATERIAL WHICH THEY SUSPECT MIGHT BE HAZARDOUS OR TOXIC, THEY SHALL IMMEDIATELY ADVISE THE OWNER. THE CONTRACTOR SHALL TAKE IMMEDIATE AND APPROPRIATE ACTION TO PROTECT THE BUILDING USERS AND WORKERS IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL LAWS, CODES AND REGULATIONS. THE ARCHITECT AND ARCHITECT'S CONSULTANTS SHALL HAVE NO RESPONSIBILITY FOR THE DISCOVERY, PRESENCE, HANDLING, REMOVAL OR DISPOSAL OF OR EXPOSURE OF PERSONS TO HAZARDOUS MATERIALS IN ANY FORM AT THE PROJECT SITE, INCLUDING BUT NOT LIMITED TO ASBESTOS, ASBESTOS PRODUCTS, POLYCHLORINATED BIPHENYL (PCB) OR OTHER TOXIC SUBSTANCES.

1. THE CONTRACTOR IS HEREBY ADVISED THAT SHERMAN-CARTER-BARNHART, PLLC IS NOT A DESIGN PROFESSIONAL IN THE DETERMINATION OF THE PRESENCE OF HAZARDOUS MATERIALS, NOR IS SHERMAN-CARTER-BARNHART, PLLC A DESIGN PROFESSIONAL INVOLVED IN MAKING RECOMMENDATIONS REGARDING THE TESTING, REMOVAL, ENCAPSULATION OR OTHER CORRECTIVE MEASURES PERTAINING TO HAZARDOUS MATERIALS.
2. IF THE WORK WHICH IS TO BE PERFORMED UNDER THE CONTRACT INTERFACES IN ANY WAY WITH THE EXISTING COMPONENTS WHICH CONTAIN HAZARDOUS MATERIALS, IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTACT THE OWNER'S ENVIRONMENTAL CONSULTANT REGARDING THE PROPER MEANS AND METHODS TO BE UTILIZED W/ HAZARDOUS MATERIALS.
3. BY EXECUTION OF THE CONTRACT FOR CONSTRUCTION, THE CONTRACTOR HEREBY AGREES TO BRING NO CLAIM FOR NEGLIGENCE, BREACH OF CONTRACT, INDEMNITY OR OTHERWISE AGAINST THE ARCHITECT, HIS PRINCIPALS, EMPLOYEES, AGENTS OR CONSULTANTS IF SUCH A CLAIM IN ANY WAY WOULD INVOLVE THE INVESTIGATION OF OR REMEDIAL WORK RELATED TO HAZARDOUS MATERIALS IN THE PROJECT.
4. BY EXECUTION OF THE CONTRACT FOR CONSTRUCTION, THE CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD THE ARCHITECT, HIS PRINCIPALS, EMPLOYEES, AGENTS AND CONSULTANTS HARMLESS FROM ANY SUCH ASBESTOS OR OTHER HAZARDOUS MATERIALS RELATED CLAIMS THAT MAY BE BROUGHT BY THE CONTRACTOR'S SUBCONTRACTORS, SUPPLIERS OR OTHER THIRD PARTIES WHO MAY BE ACTING UNDER THE DIRECTION OF THE CONTRACTOR PURSUANT TO THIS PROJECT.

SALVAGE NOTES

1. SALVAGE EXISTING STONE SILLS AT WINDOWS AND SILLS IDENTIFIED TO BE REMOVED FOR REUSE.
2. UPON CONTRACTOR'S COMMENCEMENT OF THE WORK, ANY EQUIPMENT, FURNISHINGS, CONSTRUCTION WITHIN THE AREAS OF RENOVATION ARE THE CONTRACTOR'S RESPONSIBILITY TO PROBERLY DISPOSE.

DEMOLITION LEGEND

(dashed lines)	EXISTING CONSTRUCTION TO BE REMOVED
(solid grey wall)	EXISTING CONSTRUCTION TO REMAIN, UNLESS NOTED OTHERWISE
(dashed door)	EXISTING DOOR AND / OR FRAME TO BE REMOVED, U.N.O - REFER TO DEMOLITION KEY NOTES
(solid door)	EXISTING DOOR AND / OR FRAME TO REMAIN - REFER TO DEMOLITION KEY NOTES

PHASING NOTES

CONTRACTOR TO PHASE ALL WORK AT LEGRANDE ELEMENTARY SCHOOL TO MINIMIZE DISRUPTION OF NORMAL USE TO STUDENTS / FACULTY / VISITORS TO THE SCHOOL BUILDING AND PROPERTY. THE WORK IS TO BE PHASED AS FOLLOWS:

GENREAL PHASING NOTES:

1. IN ALL PHASES OF THIS JOB, THE CONTRACTOR MUST FULLY COOPERATE WITH THE OWNER CLOSLY TO COORDINATE ACCESS TO THE SITE, MATERIAL STORAGE AND STAGING AREAS, INTERRUPTUIONS OF UTILITIES, MAINTENANCE OF MEANS OF EGRESS AND SIMILAR ITEMS NECESSARY FOR THE OWNER'S SAFE OPERATION AND USE OF THE PREMISES DURING CONSTRUCTION.
2. THE CONTRACTOR SHALL PROVIDE TEMPORARY UTILITIES AS REQUIRED DURING CONSTRUCTION. SHOULD ABUSE OF TEMPORARY UTILITIES BE NOTED BY THE OWNER AND ARCHITECT, THE GENERAL CONTRACTOR SHALL BE CHAREGED ACCORDINGLY. ADDITIONAL OFF SITE UTILITIES THAT MAY BE REQUIRED SUCH AS PROPANE GAS OR ADDITIONAL ELECTRIC METER SERVICE SHALL BE PROVIDED BY THE CONTRACTOR. SHOULD CONTRACTOR DISCONNECT ANY EXISTING UTILITIES FROM A PORTION OR PORTIONS OF THE BUILDING DURING CONSTRUCTION AND REQUIRE ADDITIONAL UTILITIES TO BE PROVIDED FOR TEMPORARY HEAT, LIGHTING, ETC., THIS COST SHALL BE BORNE BY THE CONTRACTOR.
3. THE CONTRACTOR SHALL INSTALL TEMPORARY ENCLOSURES, DUST BARRIERS, AND EGRESS DOORS AS REQUIRED FOR CONTROL OF SOUND, DUST AND SEPARATION OF STUDENT POPULATION FROM CONSTRUCTION AREAS. THE CONTRACTOR SHALL REFER TO SPECIFICATIONS FOR ADDITIONAL SAFETY MEASURES AND TEMPORARY ENCLOSURES.
4. THE CONTRACTOR SHALL NOTIFY THE OWNER TWO (2) WEEKS PRIOR TO ANY ANTICIPATED UTILITY OUTAGES.
5. ALL WORK TO BE COMPLETED WITHIN AREAS OF THE BUILDING THAT ARE TO REMAIN OPEN SHALL BE COORDINATED WITH THE OWNER AND BUILDING OCCUPANTS.
6. THE MEANS OF EGRESS MUST BE MAINTAINED FROM ALL OCCUPIED PORTIONS OF THE FACILITY AT ALL TIMES TO THE SATISFACTION OF THE LOCAL BUILDING CODE ENFORCEMENT OFFICIALS AND THE OWNER.
7. MINOR DEMOLITION AND RENOVATION MAY NOT OCCUR IN AN OCCUPIED AREA DURING OPERATING HOURS, BUT MAY OCCUR AFTER HOURS AND DURING UNOCCUPIED HOURS. SUCH WORK MUST BE SCHEDULED WITH THE OWNER A MIN. OF (2) WEEKS IN ADVANCE .

CONT.

GENERAL DEMOLITION NOTES

A. DEMOLITION REFERENCE NOTES FOR THIS PROJECT ARE INTENDED TO GENERALLY IDENTIFY THE SELECTIVE REMOVAL OF EXISTING ITEMS AT LOCATIONS WHERE REQUIRED BUT, SHALL IN NO WAY RELIEVE THE CONTRACTOR OF THE FULL RESPONSIBILITY FOR EXAMINING AND VERIFYING THE FULL EXTENT OF EXISTING CONDITIONS AND NEW WORK PRIOR TO BIDDING THE PROJECT.

B. THE INTENT OF THE DEMOLITION NOTES IS TO PROVIDE A GENERAL OUTLINE FOR THE CONTRACTOR OF ITEMS TO BE REMOVED AND/OR TURNED OVER TO THE OWNER AND TO ALLOW FOR THE NEW CONSTRUCTION AS OUTLINED ELSEWHERE IN THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DEMOLITION AND REMOVAL OF ITEMS TO ALLOW FOR NEW CONSTRUCTION SHOWN OR NOT SHOWN ON DEMOLITION PLANS AS MAY BE REQUIRED.

C. CAVITY WALLS AND SPACES BEHIND EXTERIOR FINISHES OR PARTIALLY REMOVED WALLS / ROOFS, ETC. SHALL BE PROTECTED FROM EXPOSURE TO WEATHER BY THE CONTRACTOR. WALLS/ROOFS, ETC. SHALL BE PROTECTED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGED WALLS, ROOFS, EQUIPMENT, ETC. CAUSED BY THIS DEMOLITION OR WEATHER EXPOSURE OF ITEMS THAT ARE TO REMAIN.

D. INFORMATION AND DRAWINGS INCLUDED IN THESE CONTRACT DOCUMENTS PERTAINING TO THIS RENOVATION PROJECT HAVE BEEN OBTAINED FROM ORIGINAL DRAWINGS PROVIDED BY HART CO. SCHOOLS AND FIELD OBSERVATIONS. THIS INFORMATION IS INCLUDED HEREIN WITH THE INTENT TO PROVIDE THE CONTRACTOR WITH A BASIC UNDERSTANDING OF EXISTING CONDITIONS. ACTUAL CONDITIONS AND DIMENSIONS MAY VARY FROM THOSE INDICATED ON DRAWINGS. CONTRACTOR TO VERIFY IN FIELD DIMENSIONS AND CONDITIONS.

E. REFER TO STRUCTURAL DRAWINGS FOR SPECIFIC REQUIREMENTS AT EXISTING CONDITIONS REQUIRING PARTIAL OR COMPLETE REMOVAL AND/OR MODIFICATION TO COMPONENTS OR ASSEMBLIES PERTAINING TO EXISTING BUILDING STRUCTURE.

F. REFER TO MECHANICAL AND/OR ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR SPECIFIC REQUIREMENTS PERTAINING TO THE REMOVAL, RELOCATION AND/OR MODIFICATION OF ITEMS RELATED TO EXISTING MECHANICAL AND ELECTRICAL SYSTEMS.

G. SHOULD THE CONTRACTOR ENCOUNTER ANY MATERIALS DURING SELECTIVE DEMOLITION AND NEW WORK WHICH ARE SUSPECTED BY THE CONTRACTOR TO BE OF AN UNKNOWN OR QUESTIONABLE COMPOSITION WITH RESPECT TO CONTAINING CONTAMINANTS WHICH MAY BE HAZARDOUS TO HUMAN HEALTH, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER OF SUCH FINDINGS.

H. WHERE AN EXISTING WALL IS REMOVED AND NO NEW WALL IS SHOWN TO BE INSTALLED, REMOVE EXISTING WALL TO 8 INCHES BELOW ADJACENT FLOOR SLAB. PATCH AND REPAIR SLAB AS REQUIRED FOR INSTALLATION OF NEW FLOOR FINISH. REFER TO NEW WORK PLANS.

I. ALL AREAS LEFT EXPOSED AS A RESULT OF DEMOLITION AND/OR EQUIPMENT REMOVAL SHALL BE PATCHED AND REPAIRED TO RESULT IN A FLUSH SMOOTH SURFACE PREPARED TO RECEIVE NEW FINISHES AS SCHEDULED. ANY AREAS / OPENINGS IN MASONRY WALLS LARGER THAN 2" EXPOSED TO VIEW SHALL BE PATCHED WITH SOAPED IN CMU UNITS TOOTHED-IN INTO EXISTING MASONRY.

J. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL PATCHING AND REPAIRING DUE TO DEMOLITION AND/OR REMOVAL OF EQUIPMENT TO CREATE A FLUSH, SMOOTH SURFACE PROPERLY PREPARED TO RECEIVE NEW FINISHES AS SCHEDULED. CONTRACTOR SHALL SOAP IN NEW CMU TO MATCH EXISTING ADJACENT AREAS.

K. REFER TO MECH/ELEC DRAWINGS FOR SPECIFIC NOTES REGARDING REMOVAL OF EXISTING MECH/ELEC ITEMS.

L. REFER TO STRUCTURAL DRAWINGS FOR NEW WORK (I.E. NEW FOOTING, ETC.) WHICH MAY REQUIRE DEMOLITION WORK IN ADDITION TO ITEMS NOTED ON THE ARCHITECTURAL DRAWINGS ALL SUCH WORK SHALL BE PERFORMED BY THE CONTRACTOR.

M. REFER TO CIVIL/SITE DRAWINGS FOR ADDITIONAL DEMOLITION OF SITE/CIVIL ITEMS.

N. CONTRACTOR TO PROVIDE ALL SHORING AND BRACING AS REQUIRED TO SECURE ADJACENT CONSTRUCTION DURING DEMOLITION AND SELECTED DEMOLIITION WORK.

0. INFILL ALL EXISTING MASONRY OPENINGS FROM MPE DEMOLITION. OPENINGS LESS THAN 2"X2" TO BE FILLED WITH BACKER ROD AND SEALANT. ANY LARGER OPENING TO BE FILLED WITH CMU. TOOTH IN WHERE EXPOSED TO VIEW.

PHASING NOTES (CONT.)

8. INTERRUPTION OF ANY OF THE BUILDING UTILITIES MAY ONLY OCCUR AFTER HOURS, DURING UNOCCUPIED PERIODS OR DURING HOLIDAYS OR SCHEDULED VACATIONS. FULL SERVICE MUST BE RESTORED TO OCCUPIED AREAS OF THE FACILITY PRIOR TO RE-OCCUPANCY.
9. NO CONDITIONS WILL BE PERMITTED WHICH, IN THE OPINION, OF THE OWNER, CODE OFFICIAL, OR THE ARCHITECT CONSTITUTES AN UNSAFE CONDITION OR HAZARD TO THE OCCUPANTS OR CONTINUE USE OF THE FACILITY.
10. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN ALL SIGNAGE AND TRAFFIC CONTROL DEVICES REQUIRED THROUGH AND AROUND THE SITE. COORDINATE WITH THE OWNER.
11. CONTRACTOR IS RESPONSIBLE FOR KEEPING THE SITE SECURE AND SAFE AT ALL TIMES.
12. TEMPORARY PEDESTRIAN ROUTES SHALL BE ADA ACCESSIBLE.
13. ALL EXISTING DRIVES SHALL REMAIN OPEN WHILE SCHOOL IS IN SESSION.

APPROXIMATE SCHEDULE FOR HART CO SCHOOLS: (SCHEDULE IS SUBJECT TO CHANGE. COORDINATE WITH OWNER)

AUGUST 15, 2023	FACULTY PROFESSIONAL DEVELOPMENT ON-SITE.
AUGUST 22, 2023	STUDENT'S COMMENCE NORMAL WEEKDAY CLASSROOM SCHEDULE.
SEPTEMBER 4, 2023	HOLIDAY.
SEPTEMBER 22, 2023	EARLY RELEASE OF STUDENTS AND FACULTY.
OCTOBER 2-6, 2023	FALL BREAK FOR STUDENTS AND FACULTY.
OCTOBER 20, 2023	EARLY RELEASE OF STUDENTS AND FACULTY.
NOVEMBER 7, 2023	FACULTY PROFESSIONAL DEVELOPMENT ON-SITE.
NOVEMBER 22-24, 2023	HOLIDAY.
DECEMBER 19, 2023	EARLY RELEASE OF STUDENTS AND FACULTY.
DECEMBER 20-29, 2023	WINTER BREAK FOR STUDENTS AND FACULTY.
JANUARY 1, 2024	HOLIDAY.
JANUARY 2, 2024	STUDENT'S COMMENCE NORMAL WEEKDAY CLASSROOM SCHEDULE.
JANUARY 15, 2024	HOLIDAY.
JANUARY 26, 2024	EARLY RELEASE OF STUDENTS AND FACULTY.
FEBRUARY 16, 2024	EARLY RELEASE OF STUDENTS AND FACULTY.
MARCH 16, 2024	FACULTY PROFESSIONAL DEVELOPMENT ON-SITE.
APRIL 1, 2024	EARLY RELEASE OF STUDENTS AND FACULTY.
APRIL 2, 2024	SPRING BREAK.
APRIL 19, 2024	EARLY RELEASE OF STUDENTS AND FACULTY.
MAY 21, 2024	FACULTY PROFESSIONAL DEVELOPMENT ON-SITE.
MAY 27, 2024	HOLIDAY.
MAY 28, 2024	STUDENTS CONCLUDE NORMAL WEEKDAY CLASSROOM SCHEDULE.
___	___
___	___
___	___
___	___

WORK BY OTHERS TO BE COORDINATED BY CONTRACTOR

THE OWNER IS CONTRACTING WITH OTHERS IN SEPARATE BID DOCUMENTS TO RENOVATE AND IMPROVE THE EXISTING SANITARY TREATMENT SYSTEM OF LEGRANDE ELEMENTARY SCHOOL. DRAWINGS ARE INCLUDED WITHIN THESE DOCUMENTS FOR BIDDING CONVENIENCE. DOCUMENTS FOR SANITARY TREATMENT SYSTEM BY ENSAFE / OTHERS ARE NOT UNDER SHERMAN CARTER BARNHART ARCHITECTS STAMP OR SIGNATURE. WORK ON THE RENOVATION AND IMPROVEMENT TO THE SANITARY TREATMENT SYSTEM BY OTHERS WILL COINCIDE WITH WORK FOR THE ADDITION & RENOVATION CONTAINED WITH THESE CONSTRUCTION DOCUMENTS. THE CONTRACTOR IS TO COORDINATE WORK WITH OWNER'S OTHER CONTRACTOR(S) AS REQUIRED FOR CONCURRENT WORK AND TO MAINTAIN THE SCHEDULE.

PHASE 1 - SANITARY TREATMENT REPLACEMENT :

CONTRACTOR TO SUBSTANTIALLY COMPLETE SANITARY TREATMENT REPLACEMENT WITHOUT DISRUPTION OF THE EXISTING SANITARY TREATMENT SYSTEM OR NORMAL FUNCTIONS OF THE SCHOOL.

PHASE 2 – BUILDING ADDITION AND NON-DISRUPTIVE MEP WORK:

CONTRACTOR TO COMMENCE WORK ASSOCIATED WITH THE BUILDING ADDITION WITHOUT DISRUPTION OF THE EXISTING KITCHEN AND RESTROOMS ACCESS OR FUNCTIONS. THE EXISTING CAFETERIA MAY BE REDUCED BY APPROXIMATELY 20% OF AREA FOR LIMITED RENOVATION WORK (AND BARRICADES ERECTED TO SEGREGATE STUDENTS FROM WORK AREAS). MEP MAY NOT DISRUPT OWNER'S NORMAL USE AND DISRUPTIVE MEP WORK.

PHASE 3 – GANG RESTROOMS RENOVATION:

THE EXISTING GANG RESTROOMS (ROOMS 115 & 116) AND MEP WORK THAT DISRUPT NORMAL USE OF THE FACILITY ARE TO REMAIN IN USE THROUGHOUT THE NORMAL ACADEMIC YEAR. RENOVATION MUST OCCUR AND BE COMPLETED DURING A SINGLE, LONG BREAK PERIOD.

PHASE 3 – RENOVATION:

CONTACTOR TO SUBSTANTIALLY COMPLETE BUILDING ADDITION. SCHOOL FORCES WILL VACATE THE EXISTING KITCHEN AND CAFETERIA SO THAT RENOVATION WORK MAY OCCUR IN THOSE AREAS.

NOTES:

a. REFERENCE TO "SUBSTANTIAL COMPLETION" ABOVE APPLIES TO BENEFICIAL USE OF THE OWNER OF THE SPACE BEING DESCRIBED. THE USE DOES NOT IMPLY SUBSTANTIAL COMPLETION OF THE OVERALL SCHEDULE AS IDENTIFIED IN THE PROJECT MANUAL.
b. THE CONTRACTOR IS TO MAINTAIN ALL MEANS OF EGRESS AND CLEAR PASSAGE THROUGH CONSTRUCTION AREAS AS NEEDED. PROVIDE BARRICADES, WALKING SURFACE AND SHELTER AS NEEDED TO PROTECT STUDENTS, VISITORS AND FACULTY.

SHERMAN CARTER BARNHART ARCHITECTS

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

DEMOLITION PLAN, DETAILS & NOTES

JOB NO.	2210
DATE	08 / 03 / 23
DRAWN	Author
CHECKED	TSS

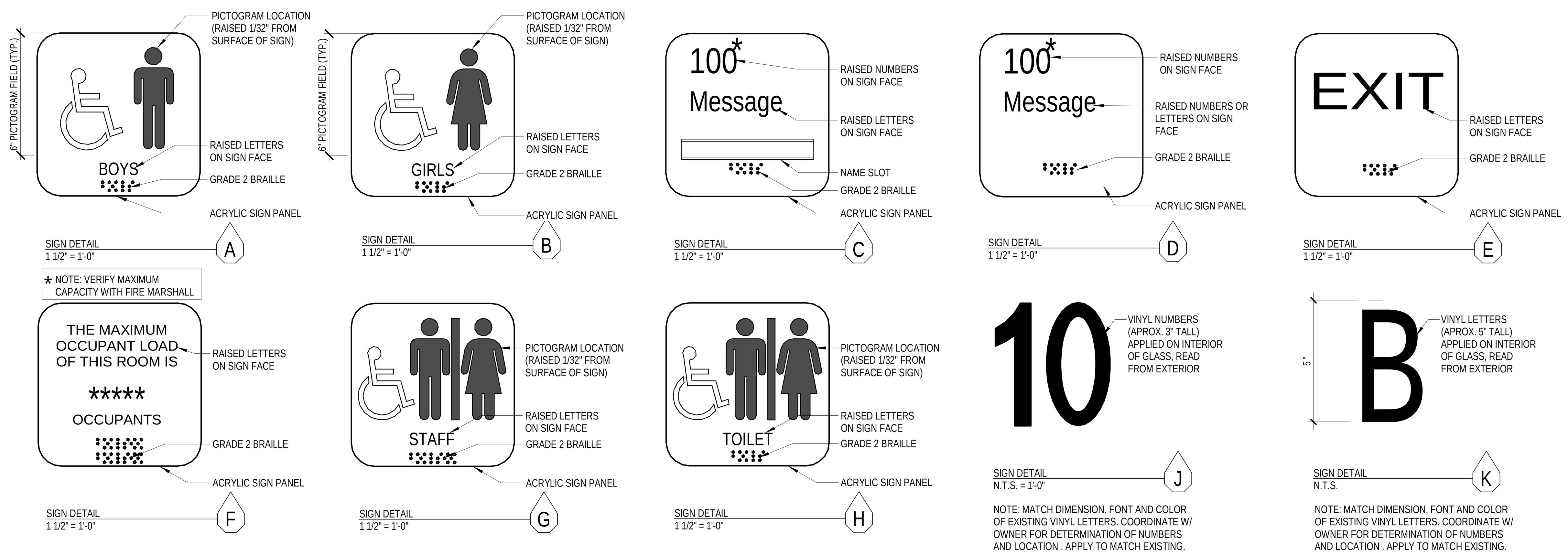
REVISIONS

No.	Description	Date

SHEET

D1.0

2210
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/3/2023 3:02:43 PM



SIGN DETAIL
N.T.S. = 1'-0" (J)

NOTE: MATCH DIMENSION, FONT AND COLOR OF EXISTING VINYL LETTERS. COORDINATE W/ OWNER FOR DETERMINATION OF NUMBERS AND LOCATION . APPLY TO MATCH EXISTING.

SIGN DETAIL
N.T.S. (K)

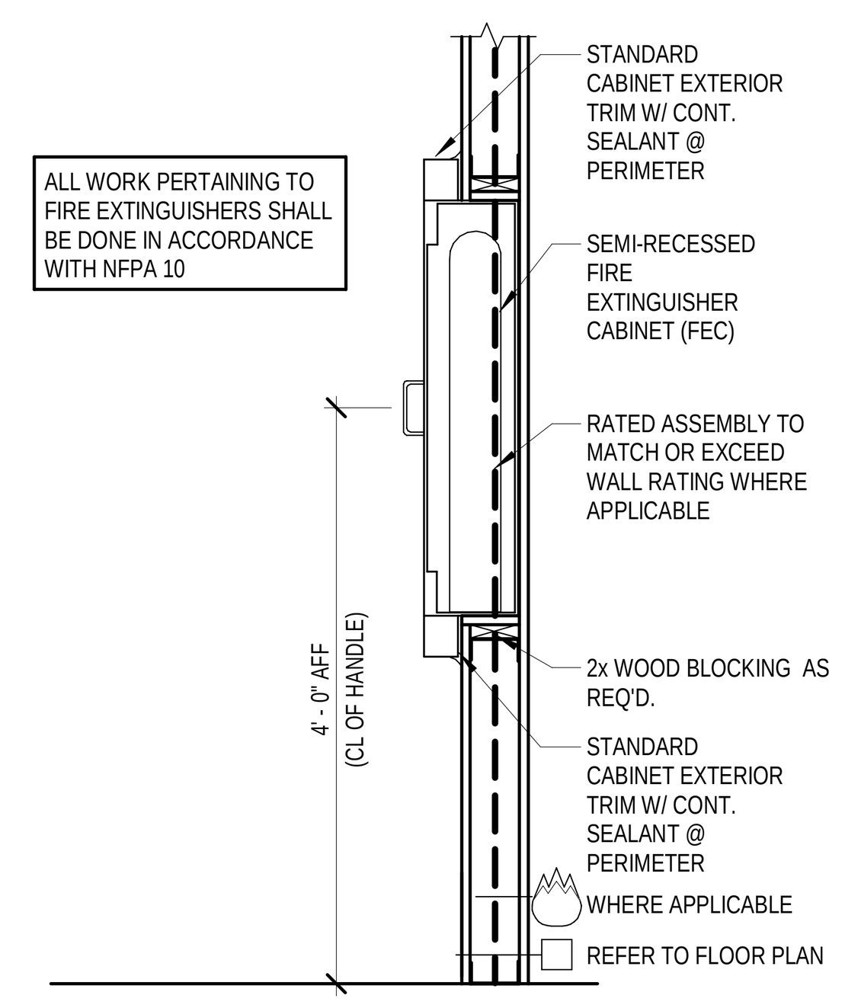
NOTE: MATCH DIMENSION, FONT AND COLOR OF EXISTING VINYL LETTERS. COORDINATE W/ OWNER FOR DETERMINATION OF NUMBERS AND LOCATION . APPLY TO MATCH EXISTING.

SIGNAGE NOTES

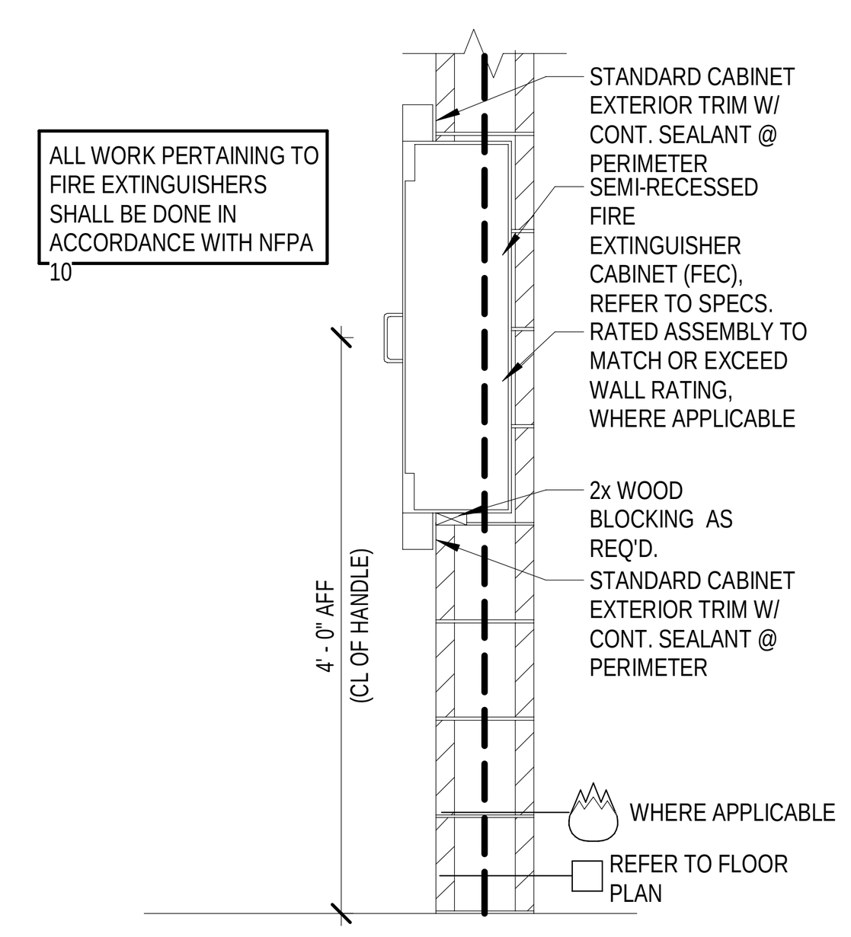
1. CHARACTERS SHOWN ON THIS SHEET ARE COMPUTER GENERATED. SPACING OF CHARACTERS IS DIAGRAMATIC. CORRECT "VISUAL" SPACING IS THE RESPONSIBILTY OF THE MANUFACTURER.
2. PICTOGRAMS ARE SHOWN HEREIN FOR INFORMATION AND INTENT ONLY. MECHANICAL, CAMERA - READY ARTWORK SHALL BE SUPPLIED BY THE SIGNAGE CONTRACTOR.
3. COLORS OF PANEL SIGNS TO BE SELECTED BY OWNER.
4. UNLESS OTHERWISE NOTED, ALL SIGNS TO BE MOUNTED BESIDE DOORS AT 5'-0" A.F.F. TO CENTER OF SIGN AND 2" FROM EDGE OF DOOR FRAME ON THE STRIKE SIDE. THE ARCHITECT SHALL BE CONSULTED BEFORE PLACEMENT OF SIGNAGE FOR LEFTHAND AND RIGHTHAND ORIENTATION OF SIGNS.
5. (*) ON SIGN DETAILS = THREE CHARACTER NUMBER TO BE SUPPLIED BY OWNER.
6. ALL SIGNAGE SHALL MEET REQUIREMENTS OF ADAAG OF THE AMERICANS WITH DISABILITIES ACT (ADA) AND ICC (ANSI) A117.1-2009
7. MESSAGE (COPY) TO BE DETERMINED BY OWNER.
8. ALL SIGNS TO BE MINIMUM OF 8"x8" INCREASE PANEL SIZE OVERALL DIMENSIONS AS NECESSARY TO ACCOMODATE MESSAGE. MAINTAIN 3/8" TALL LETTERS.
9. NOTE: ROOM NAMES AND NUMBERS SHOWN HERE ARE FOR CONSTRUCTION PURPOSES ONLY. FINAL ROOM NAMING AND NUMBERING FOR SIGNAGE SHALL BE PROVIDED BY OWNER
10. WHERE PANELS ARE INSTALLED UPON GLASS PROVIDE BLANK BACK-PLATE OF SAME COLOR ON OPPOSITE SIDE OF SIGN.

SIGN DETAILS

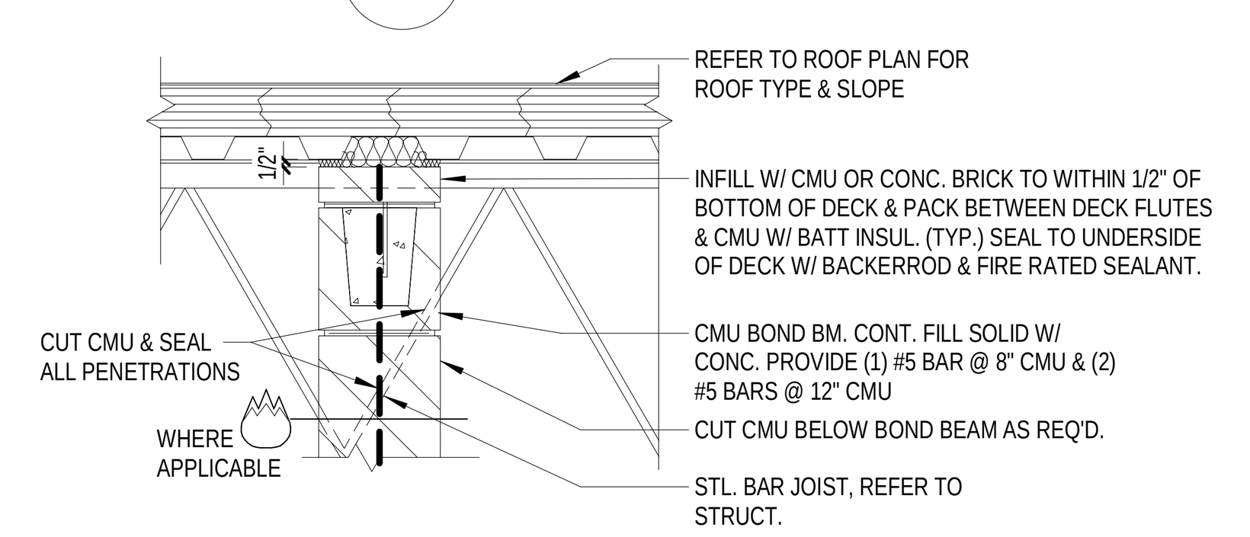
3" = 1'-0"



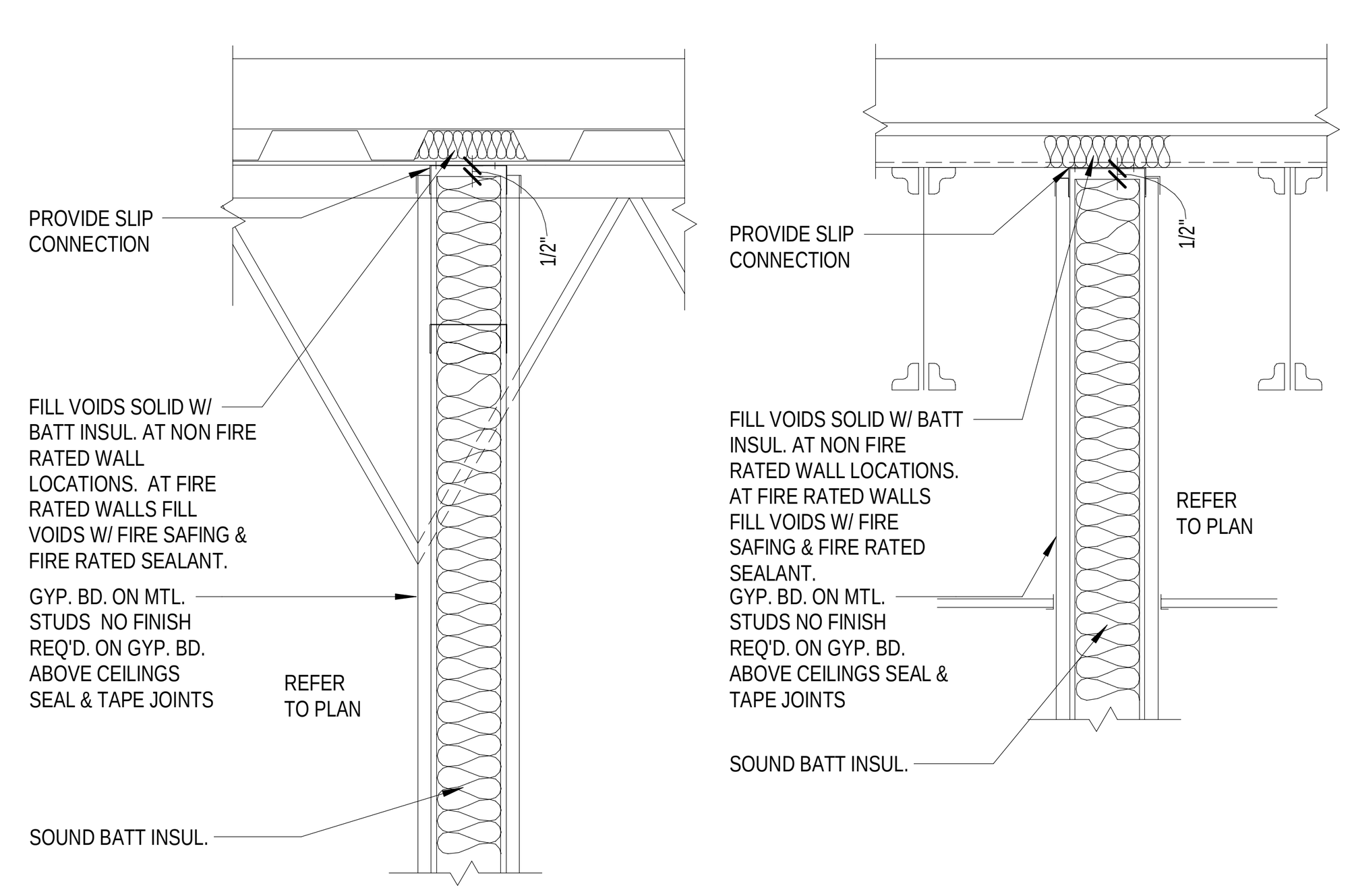
2 FEC SECTION AT STUD WALL
3/4" = 1'-0"



1 FEC SECTION AT CMU
3/4" = 1'-0"



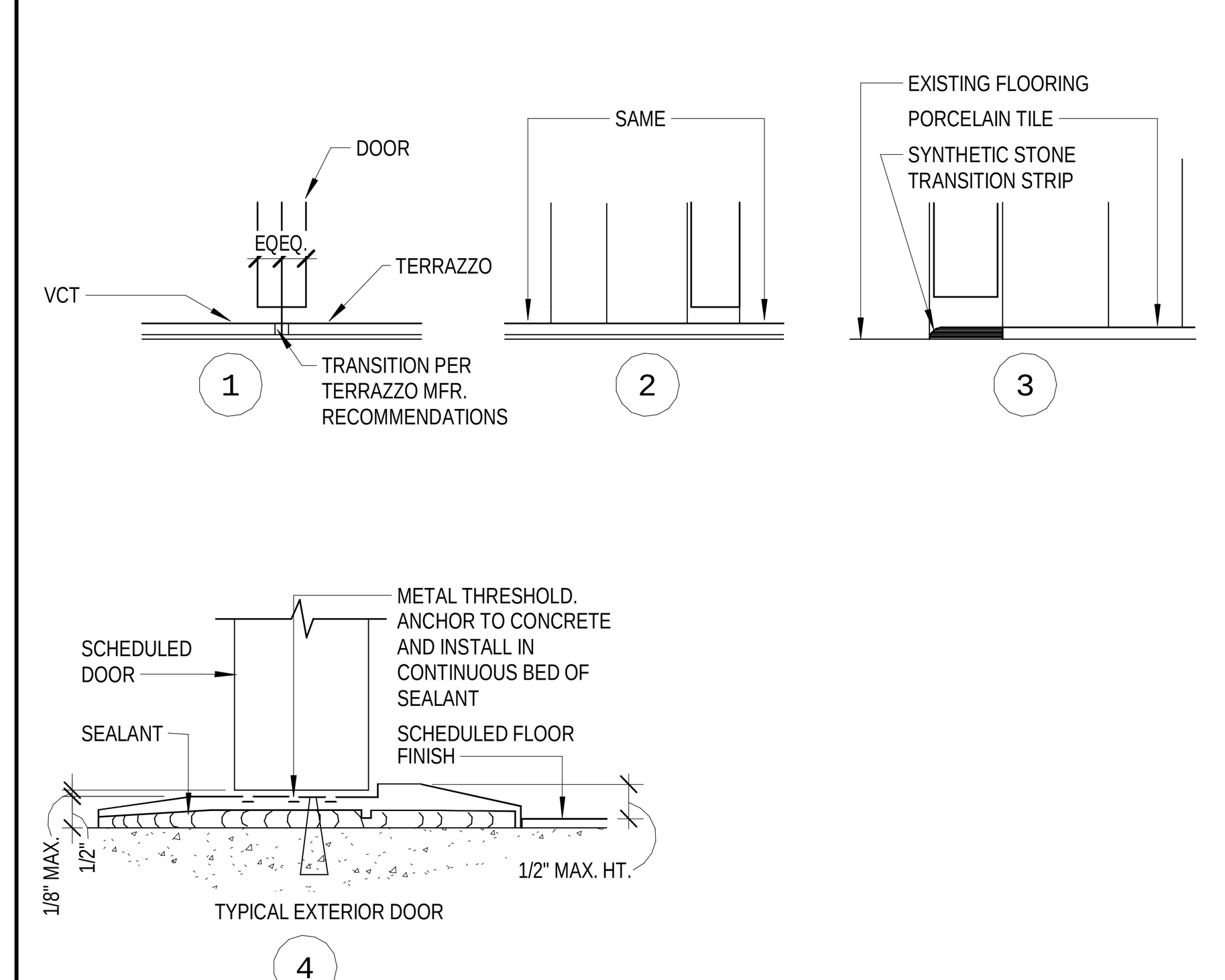
3 TYP. NON LOAD BEARING CMU PARTITIONS
1" = 1'-0"



4 TYP. NON LOAD BEARING MTL STUD/ GYP BD PARTITION
1 1/2" = 1'-0"

TYPICAL THRESHOLD DETAIL CONDITIONS - N.T.S.

NOTE: REFER TO ROOM FINISH GROUPS. IT IS CONTRACTOR'S RESPONSIBILITY TO MAKE SURE PROPER THRESHOLD IS USED.



GENERAL PARTITION TYPE NOTES

P1 PARTITION TYPE. ALL WALLS TO BE EXTENDED FULL HEIGHT TO UNDERSIDE OF FLOOR OR ROOF DECK ABOVE, UNLESS NOTED OTHERWISE (SEE BELOW).

EX SCHEDULED MASONRY WALL TO EXTEND A MIN. OF 4" OR NEXT BLOCK COURSE FROM HIGHEST ADJACENT CEILING (UNLESS NOTED OTHERWISE) AND EXTEND PARTITION TO UNDERSIDE OF DECK ABOVE WITH 3 5/8" METAL STUDS AT 16" O.C./SOUND BATT INSUL./ 5/8" GYP. BD. BOTH SIDES.

0'-0" INDICATES HEIGHT A.F.F. OF SCHEDULED WALL

P2 ALL EXTERIOR WALLS ARE WALL TYPE [A] AND ALL INTERIOR PARTITIONS ARE WALL TYPE [1] UNLESS NOTED OTHERWISE.

P3 INTERIOR WALL TYPES ARE IDENTIFIED BY NUMBER AND EXTERIOR WALL ASSEMBLY TYPES BY LETTER.

P4 PROVIDE SPECIFIED CLOSURES AND INSTALL BETWEEN DECK FLUTES AND MASONRY OR DRYWALL PARTITIONS TO ACHIEVE FULL AND COMPLETE CLOSURE OF ALL VOIDS AT TOP OF WALLS INDICATED TO EXTEND FULL HEIGHT.

P5 PARTITION TYPES SHALL MAINTAIN THEIR RESPECTIVE SEPARATION RATING (IF ANY) FOR FULL HEIGHT. ALL MECH., ELEC. AND PLUMBING PENETRATIONS SHALL BE SEALED / SAFED / DAMPERED AS REQUIRED TO COMPLY WITH APPLICABLE CODES.

P6 NOT USED.

P7 PROVIDE THE FOLLOWING CLOSURE MATERIALS AT TOP OF INTERIOR MASONRY AND METAL STUD WALLS AND PARTITIONS.
(a) FULL-HEIGHT NON-RATED WALLS: FILL VOIDS WITH BATT INSULATION.
(b) RATED FULL HEIGHT WALLS: FILL VOIDS WITH FIRE SAFING AND INSTALL BACKER ROD AND FIRE RATED SEALANT ON EACH SIDE OF WALL.
(c) FULL HEIGHT UNRATED INCIDENTAL USE SEPARATION PARTITIONS: FILL VOIDS WITH INSULATION AND INSTALL BACKER ROD AND SEALANT ON EACH SIDE OF WALL.

P8 ALL DIMENSIONS ARE TO FACE OF STUDS, MASONRY, OR TO CENTERLINE OF STRUCTURAL STEEL, UNLESS NOTED OTHERWISE.

P9 NOT USED.

P10 REFER TO WALL SECTIONS AND MISCELLANEOUS DETAILS FOR WALL TRANSITIONS ABOVE ADJACENT ROOF LEVELS - I.E.: BRICK LEDGES, CMU WIDTH AND WALL TYPE TRANSITIONS.

P11 BULLNOSE CMU SHALL BE USED AT ALL OUTSIDE CORNERS.

P12 ALL RUNNING BOND MASONRY SHALL BE INSTALLED WITH GALVANIZED HORIZONTAL MASONRY REINFORCEMENT AT EVERY OTHER VERTICAL MASONRY COURSE U.N.O..

P13 REFER TO STRUCT. DWGS. FOR REQUIREMENTS AND LOCATIONS OF WALLS TO RECEIVE VERTICAL REINFORCING @ PARAPET WALLS

P14 REFER TO STRUCTURAL AND ARCHITECTURAL DWGS. FOR OTHER REQUIREMENTS PERTAINING TO REINFORCED UNIT MASONRY.

P15 PROVIDE SPECIFIED BRICK CAVITY VENTS AT 48" O.C., AT TOP OF WALL CAVITIES AND ABOVE MORTAR NET AT BOTTOM OF WALL CAVITIES TO ALLOW FOR PROPER VENTING OF WALLS.

P16 CONCRETE MASONRY UNITS INSTALLED AT EXTERIOR WALLS SHALL RECEIVE APPLICATION OF SPECIFIED DAMP PROOFING ON CAVITY FACE, EXCEPT AT WALL RECEIVING SPRAY FOAM CAVITY INSULATION.

P17 CONTRACTOR SHALL INSTITUTE ALL MEASURES NECESSARY TO ACHIEVE WEATHERTIGHTNESS OF EXTERIOR WALLS BY ALLOWING POSITIVE DRAINAGE OF WATER TO THE EXTERIOR WHERE FLASHING IS INDICATED OR REQUIRED.
(a) KEEP ALL CAVITIES FREE OF MORTAR.
(b) PROVIDE WEEPS ON TOP OF THRU-WALL FLASHING AT 16" O.C. HORIZONTAL AND DO NOT ALLOW THEM TO BECOME CLOSED-OFF.
(c) PROVIDE SPECIFIED APPLICATION OF DAMPPROOFING ON CAVITY FACE OF CONCRETE MASONRY UNIT. EXCEPT AT WALLS RECEIVING SPRAY FOAM INSULATION.
(d) TOOL ALL MORTAR JOINTS AT THE PROPER TIME TO CONSOLIDATE THE SURFACE AND REDUCE WATER INFILTRATION.
(e) REFER TO STRUCT FOR THE USE OF LIGHT-WEIGHT OR OTHER THAN THE SPECIFIED CONCRETE UNIT MASONRY BACK-UP AT SINGLE-WYTHE OR MONOLITHIC WALLS WILL NOT BE PERMITTED AT EXTERIOR WALLS.
(f) INSTALL MORTAR NETTING AT ALL THROUGH WALL FLASHING LOCATIONS.
(g) PRIOR TO APPLICATION OF DAMP-PROOFING, CONTRACTOR TO SEAL ALL CONTROL JOINTS, EXPANSION JOINTS & PENETRATIONS IN CMU.
(h) ALL THRU-WALL FLASHING TO EXTEND 1/2" MIN. BEYOND FACE BRICK. FLASHING TO BE TRIMMED FLUSH WITH FACE BRICK PER DIRECTION OF ARCHITECT.

P18 INTERIOR MASONRY AND/OR GYPSUM BOARD EXPOSED TO VIEW SHALL BE PAINTED, UNLESS NOTED OTHERWISE. REFER TO ROOM FINISH GROUPS.

P19 REFER TO ROOM FINISH GROUPS FOR BASE CONDITION.

P20 AT EXTERIOR MASONRY WALLS, CMU SHALL BE EXTENDED TIGHT TO FLOOR AND/OR ROOF DECKS, INCLUDING AROUND ALL PENETRATIONS SUCH AS BEAMS, JOIST ENDS, AND ETC. FILLING VOIDS IN EXT. CMU BACK-UP WITH INSULATION IN LIEU OF A SOLID MASONRY ENCLOSURE SHALL NOT BE PERMITTED.

P21 REFER TO PARTITION DETAILS THIS SHEET FOR SPECIFIC CONNECTION AND ATTACHMENT/ BRACING OF NON-LOAD BEARING INTERIOR PARTITION WALL TO STRUCTURE/ DECK ABOVE.

P22 NOT USED.

P23 WHERE GYP. ASSEMBLIES SPECIFIED AT WET WALL LOCATIONS, WATER RESISTANT GYPSUM BOARD TO BE INSTALLED.

P24 METAL STUD FRAMED PARTITIONS, SOFFITS, ETC. TO BE LATERALLY BRACED TO UNDERSIDE OF ROOF FRAMING OR ADJACENT MASONRY WALLS AT 8'-0" O.C. MAX. U.N.O.

P25 NON-REINFORCED, SINGLE-WYTHE, MASONRY PARTITION WALLS THAT ARE SCHEDULED TO STOP 4" ABOVE ADJACENT CLG. AND EXCEED 20'-0" UNBRACED LENGTH (I.E. INTERSECTING WALLS OR CORNERS) SHALL BE LATERALLY BRACED AT 8'-0" O.C. W/ 16 GA. 6" METAL STUD FRAMING TO UNDERSIDE OF ROOF STRUCTURE ABOVE.

P26 REFER TO DETAILS B AND 4 ON SHEET A0.0 FOR TYPICAL INTERIOR NON-LOAD BEARING FULL HT.

P27 NOT USED.

P28 NOT USED.

P29 ALL INTERIOR MASONRY WALLS SHALL RECEIVE CONTROL JOINTS AT 20'-0" MAX. U.N.O.

P30 SAWCUT ALL NON-LOAD-BEARING MASONRY SO AS TO MAINTAIN A 3/8" SOFT JOINT BETWEEN TOP OF MASONRY AND BOTTOM OF STRUCTURE.

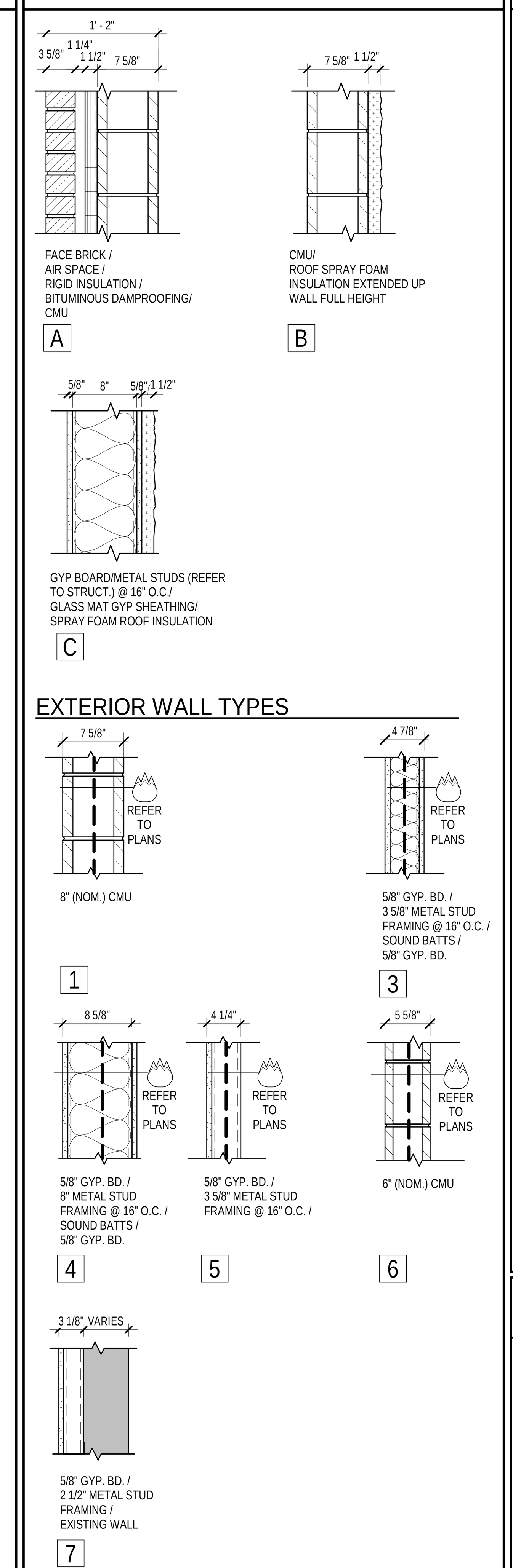
P31 EXTERIOR WALLS ARE TO BE SEALED "AIRTIGHT".

P32 REFER TO SPECIFICATIONS FOR GYPSUM BOARD CONTROL JOINT SPACING REQUIREMENTS.

P33 PROVIDE MECHANICAL RESTRAINT FOR INSULATION, AS REQUIRED TO MAINTAIN COMPLETE TIGHT FIT, WHERE INSULATION NOT RESTRAINED BY OTHER CONSTRUCTION.

P34 PROVIDE CLOSED CELL NEOPRENE SILL PLATE GASKET BELOW STUD TRACKS AT ALL INTERIOR AND EXTERIOR STUD WALLS TO SEPARATE STUDS FROM CONCRETE.

WALL / PARTITION TYPES



INTERIOR WALL TYPES

NOTE: WHERE NON-LOAD BEARING INTERIOR PARTITIONS INTERSECT STRUCTURE ABOVE PROVIDE SLIP-TRACK CONNECTION. ALSO, FILL VOIS IN DECKING WITH INSULATION. SEE DETAIL 4, THIS SHEET. WHERE NON-LOAD BEARING CMU PARTITIONS INTERSECT STRUCTURE ABOVE, DO NOT ABUT CMU DIRECTLY TO STRUCTURE. SEE DETAIL 3, THIS SHEET.

ROOM FINISH GROUPS

GENERAL NOTES:

1. WHERE MORE THAN ONE FINISH IS LISTED REFER TO PLANS, SECTIONS, INTERIOR ELEVATIONS AND DETAILS.
2. REFER TO TYPICAL FLOOR TRANSITION / THRESHOLD CONDITIONS, THIS SHEET.
3. REFER TO REFLECTED CEILING PLAN, SHEET A3.1 FOR CEILING INFORMATION.
4. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION AT CEILINGS.
5. PAINTING SHALL BE BY CONTRACTOR.
6. CONTRACTOR SHALL PREPARE ALL NEW AND EXISTING SURFACES TO RECEIVE PAINT (I.E. DRYWALL FINISHING, BLOCK FILLER, ETC.)
7. AT AREAS OF WORK ON EXISTING FINISHES THE CONTRACTOR IS TO CLEAN ALL SURFACES AND PREP/FINISH AS RECOMMENDED BY MANUFACTURER.

RFG		
XXX 01	FLOOR:	PREMIUM VCT TILE
	BASE:	VINYL
	WALL:	PAINT
XXX 02	FLOOR:	PORCELAIN TILE
	BASE:	PORCELAIN TILE
	WALL:	PORCELAIN TILE FULL HEIGHT THROUGHOUT
XXX 03	FLOOR:	STANDARD VCT TILE
	BASE:	VINYL
	WALL:	PAINT (EXISTING BRICK AND NEW/EXISTING CMU)
XXX 04	FLOOR:	NO WORK
	BASE:	NO WORK
	WALL:	NO WORK
XXX 05	FLOOR:	TERRAZZO
	BASE:	TERRAZZO BASE
	WALL:	PAINT
	REFER TO ALTERNATE NO. 01	
XXX 06	FLOOR:	SEALED CONCRETE
	BASE:	PAINTED BASE – 8" TALL
	WALL:	PAINT
XXX 07	FLOOR:	QUARRY TILE EXCEPT AT RECESSED SLAB FOR WALK-IN COOLER AND FREEZER.
	BASE:	QUARRY TILE
	WALL:	CMU. BLOCK FILLER, PRIME & PAINT

GENERAL NOTES

GN-1 (N.I.C.) MEANS NOT IN CONTRACT. TO BE PROVIDED BY OWNER AND INSTALLED BY OWNER.

GN-2 DO NOT SCALE DRAWINGS. WRITTEN DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS.

GN-3 MASONRY DIMENSIONS ARE NOMINAL. EXTERIOR WALL DIMENSIONS ARE TO EXTERIOR SIDE OF FACE BRICK.

GN-4 REFER TO ENLARGED PLANS FOR DIMENSIONS NOT SHOWN ON 1/8" SCALE PLANS.

GN-5 CONTINUOUS SEALANT (AND BACKER ROD AS REQ'D FOR PROPER JOINT INSTALLATION) SHALL BE INSTALLED BETWEEN ALL INTERFACES OF MASONRY, HOLLOW METAL AND ALUMINUM FRAMING, FRP, GYPSUM BOARD, METAL SOFFITS/PANELS, AND OTHER MATERIAL CHANGES WHETHER SPECIFICALLY INDICATED AT ALL LOCATIONS OR NOT. BACKER ROD SHALL BE USED BEHIND ALL SEALANT CONDITIONS (TYPICAL). WHERE SPECIFIC CONDITIONS DO NOT ALLOW BACKER ROD TO BE USED, A BOND BREAKER SHALL BE USED AT THE BACK OF THE JOINT.

GN-6 AT ALL BASE LOCATIONS, CONTRACTOR TO INSTALL NON-BULLNOSE CMU AT FIRST COURSE OF MASONRY.

GN-7 ALL CONCEALED WOOD FRAMING AND PLYWOOD SHALL BE FIRE-RETARDANT TREATED (FRT) EXCEPT THAT NON-F.R.T. BLOCKING, NAILERS AND FURRING MAY BE USED WHERE INSTALLED IN ACCORD WITH KBC SECTION 803.3 (INCLUDING DIMENSIONAL WOOD BLOCKING, FIRE BLOCKING, REQUIREMENTS, ETC.). WOOD BLOCKING INSTALLED IN ACCORD WITH KBC SECTION 603, PARAGRAPH 12 FOR HANDRAILS, MILLWORK, CABINETS, WINDOWS AND DOORS IS NOT REQUIRED TO BE F.R.T. AT COPINGS AND ROOFING TERMINATIONS ALL BLOCKING SHALL BE PRESSURE TREATED (PT). WHERE WOOD BLOCKING IS IN CONTACT WITH CMU, OR CONCRETE, SUCH BLOCKING SHALL BE PRESSURE TREATED. SEE GENERAL NOTES GN-8, GN-9 AND GN-10 FOR SPECIAL REQUIREMENTS AT P.T. WOOD.

GN-8 ALL WOOD BLOCKING AND NAILERS IN CONTACT WITH CONCRETE OR MASONRY SHALL BE PRESSURE PRESERVATIVE TREATED (P.T.)

GN-9 ALL P.T. WOOD SHALL BE SEPARATED FROM CONTACT WITH ANY METAL COMPONENTS WITH SELF ADHERING ELASTOMERIC MEMBRANE FLASHING OR OTHER SIMILAR PERMANENT MEANS.

GN-10 ALL ANCHORS AND FASTENERS IN CONTACT WITH P.T. WOOD SHALL BE STAINLESS STEEL OR G90 HOT DIPPED GALVANIZED, MINIMUM.

GN-11 CONTRACTOR SHALL PROVIDE ALL CONCEALED BLOCKING REQUIRED FOR ATTACHMENT AND SUPPORT OF EQUIPMENT, FIXTURES, WINDOWS, ETC.

GN-12 GYPSUM CEILING BOARD SHALL BE USED AT ALL HORIZONTAL APPLICATIONS OF GYPSUM BOARD.

GN-13 REFER TO STRUCTURAL DRAWINGS FOR TYPES, SIZE, LOCATION, CONNECTIONS, REINFORCEMENT AND OTHER REQUIREMENTS PERTAINING TO STRUCTURAL COMPONENTS INDICATED.

GN-14 REFER TO STRUCTURAL DRAWINGS FOR LINTEL SCHEDULE. WHERE STEEL PLATES ARE A PART OF LINTELS, FACE OF LINTEL SHALL BE INSET 1/2" FROM FACE OF CMU AND / OR MASONRY VENEER, INSTALL SEALANT IN LIEU OF MORTAR TO CONCEAL LINTEL EDGE. ALL RELIEF ANGLES AND EXPOSED COMPONENTS OF STEEL LINTELS, BRACKETS, AND SUPPORTS IN EXTERIOR WALLS SHALL BE HOT-DIPPED GALVANIZED. ALL EXPOSED PORTIONS OF LINTELS AND SUPPORTS SHALL BE PAINTED, TYPICAL.

GN-15 VERIFY REQUIRED DEPTH OF ALL RECESSED SLABS WITH APPROPRIATE MANUFACTURER PRIOR TO PLACEMENT OF SLAB.

GN-16 REFER TO MECHANICAL DRAWINGS FOR ALL FLOOR DRAIN LOCATIONS, TOP OF FLOOR DRAIN ELEVATIONS ARE TYPICALLY 1" LESS THAN TYPICAL FLOOR ELEVATION, U.N.O.

GN-17 LC-BEADS SHALL BE USED AT ALL GYPSUM BOARD TERMINATIONS, TYPICAL. CORNER BEADS SHALL BE USED AT ALL GYPSUM BOARD OUTSIDE CORNERS, TYPICAL. AT ALL LC-BEADS, CORNER BEADS, AND METAL REVEALS, TRIM FLANGES SHALL BE MUDDED AND FINISHED TO PRODUCE A MONOLITHIC GYPSUM BOARD FINISH OVER THE FLANGE TO THE FINISHED EDGE.

GN-18 PAINTED ACCESS PANELS SHALL BE PROVIDED AND INSTALLED WHERE REQUIRED TO MAINTAIN CONCEALED ELECTRICAL AND MECHANICAL SYSTEMS WHETHER INDICATED ON THESE DRAWINGS OR NOT. LOCATIONS SHALL BE APPROVED BY THE ARCHITECT.

GN-19 SAWCUT ALL NON-LOAD-BEARING MASONRY SO AS TO MAINTAIN A 3/8" SOFT JOINT BETWEEN TOP OF MASONRY AND BOTTOM OF STRUCTURE.

GN-20 CONTACT BETWEEN DISSIMILAR METALS SHALL BE SEPARATED WITH BUTYL TAPE.

GN-21 APPLY WATER REPELLANT / SEALER AT ALL NEW EXTERIOR FACE BRICK AT EXTERIOR OF ROOMS 156, 159, 160, 162 AND 163. PRESSURE CLEAN ALL EXISTING BRICK AND APPLY WATER REPELLANT / SEALER ON BOTH NEW AND EXISTING BRICK FULL HEIGHT AND LENGTH.

ALTERNATES

ALT. NO. 1: CAFETERIA FLOORING TO BE PREMIUM VINYL TILE AND BASE (NOT TERRAZZO).

ALT. NO. 2: PROVIDE OWNER-PREFERRED SLONE AUTO FLUSH-VALVES TO WATER CLOSETS.

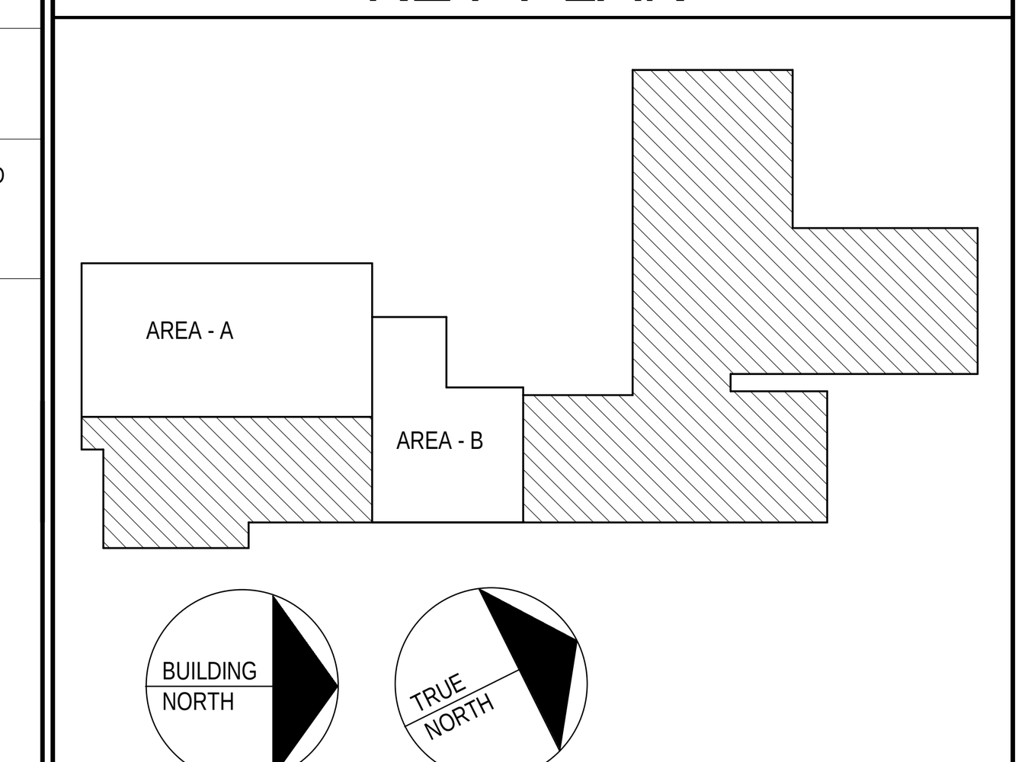
ALT. NO. 3: PROVIDE OWNER-PREFERRED BEST LOCKS TO DOOR HARDWARE.

ALT. NO. 04 PROVIDE OWNER-PREFERRED RELIABLE CONTROLS BY AUTOMATED BUILDING CONCEPTS FOR CONTROLS.

SYMBOLS LEGEND

Symbol	Description
(hatch)	EXISTING CONSTRUCTION TO REMAIN. PROTECT.
Name 101 #	ROOM FINISH GROUPS (REFER TO SHEET A0.0)
	ROOM NUMBER
#	DOOR NUMBER (DOOR SCHEDULE SHEET A4.1)
X	DEMOLITION WORK KEY NOTES (SHEET D1.0)
X	NEW WORK KEY NOTES (SHEETS A1.1 - A1.2)
X	WALL TYPE (SCHEDULE SHEET A0.0)
X	ALUMINUM OR HOLLOW METAL WINDOW OR STOREFRONT TYPE (REFER TO FLOOR PLANS AND SCHEDULE SHEET A4.1)
X	TOILET ACCESSORIES (SCHEDULE SHEET A1.1)
X	ELEVATION KEY NOTE (SHEET A1.2)
X	ROOF KEY NOTE (SHEET A1.3)
X	CEILING PLAN KEY NOTE (SHEET A3.1)
X	SIGNAGE KEY NOTE (SHEETS A0.0 AND A1.0)
FEC	FIRE EXTINGUISHER CABINET, REFER TO DTLS. THIS SHEET.
MB	MARKER BOARD
TB	TACK BOARD
CJ	CONTROL JOINT (SHEET A3.1)
DF	DRINKING FOUNTAIN
WS	WINDOW SHADES

KEY PLAN



SHERMAN CARTER BARNHART ARCHITECTS

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ABBREVIATIONS, SYMBOL LEGEND, GENERAL NOTES AND PARTITION TYPES

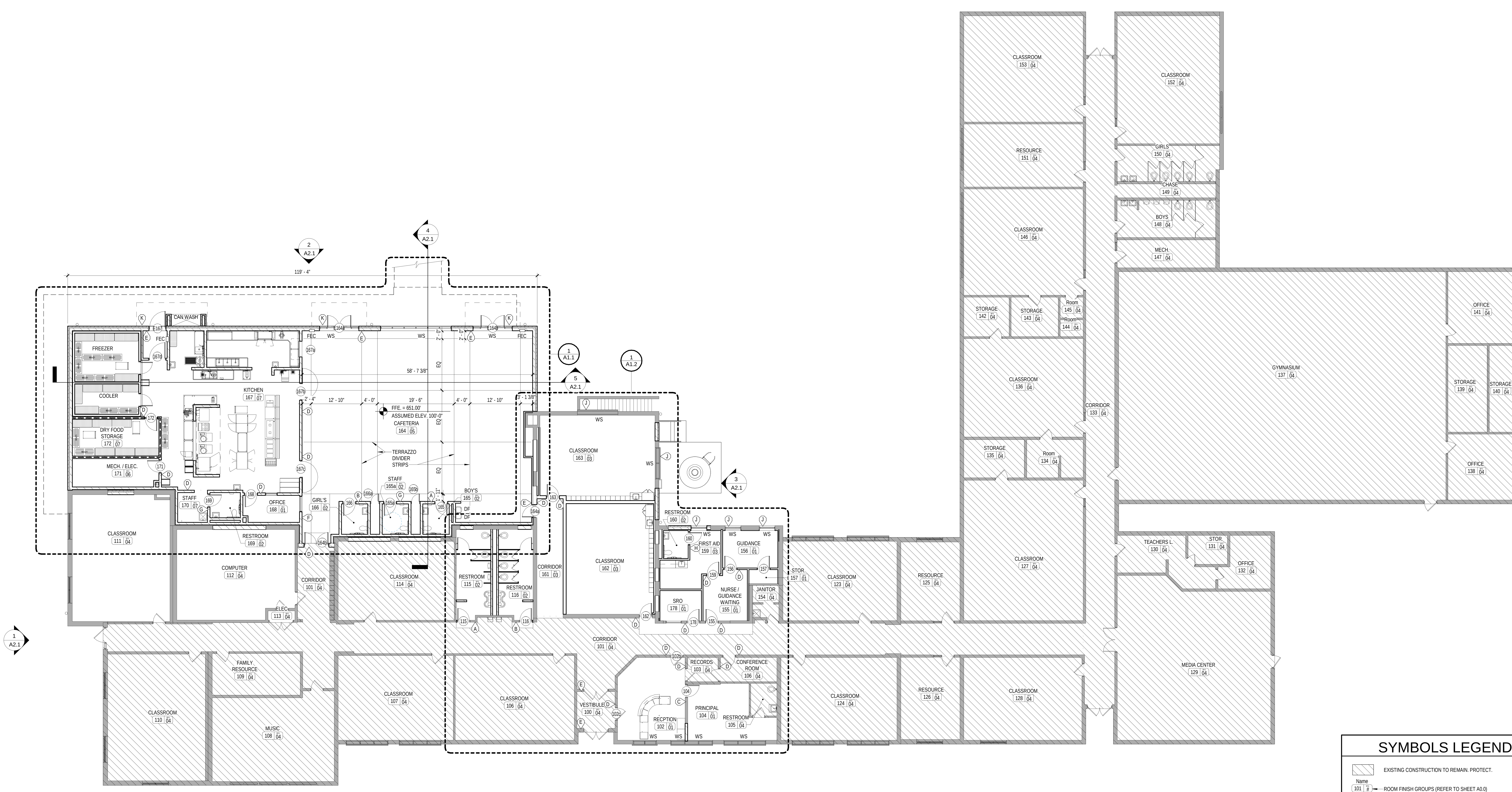
JOB NO.	2210
DATE	08 / 03 / 23
DRAWN	TM
CHECKED	TSS

REVISIONS

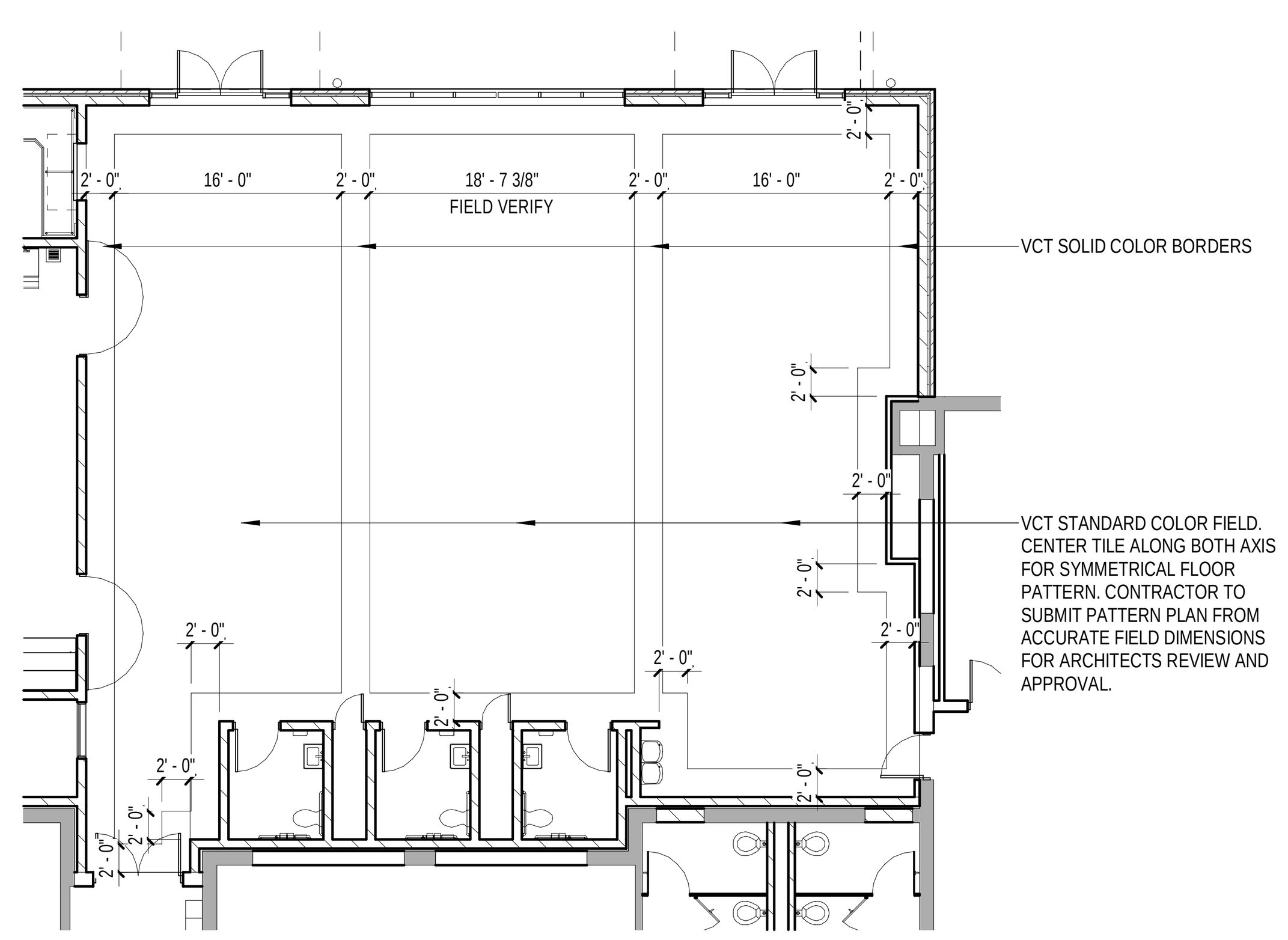
No.	Description	Date

SHEET
A0.0

2210
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/3/2023 3:02:30 PM



1 FLOOR PLAN - OVERALL
3/32" = 1'-0"



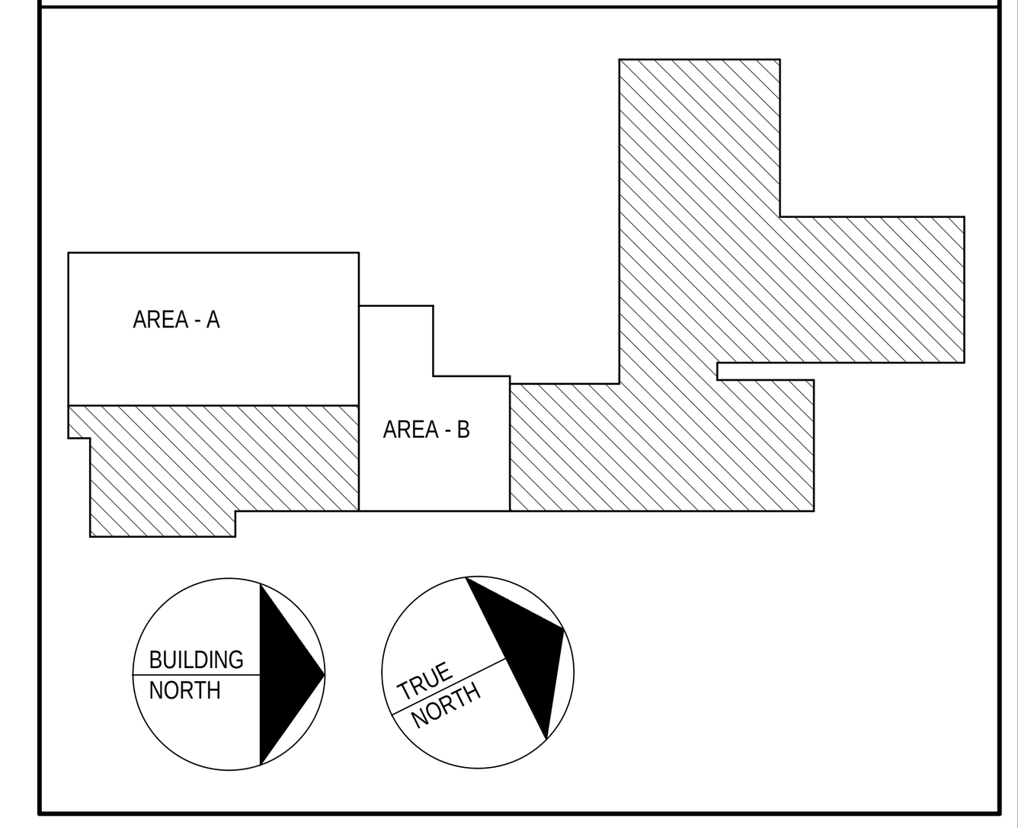
NOTE: SEE PLAN THIS SHEET FOR TERRAZZO DIVIDER STRIPS OF TERRAZZO FLOORING AND BASE (BASE BID).

2 ALTERNATE NO. 1 PLAN
3/32" = 1'-0"

SYMBOLS LEGEND

- EXISTING CONSTRUCTION TO REMAIN. PROTECT.
- ROOM FINISH GROUPS (REFER TO SHEET A0.0)
- ROOM NUMBER
- DOOR NUMBER (DOOR SCHEDULE SHEET A4.1)
- DEMOLITION WORK KEY NOTES (SHEET D1.0)
- NEW WORK KEY NOTES (SHEETS A1.1 - A1.2)
- WALL TYPE (SCHEDULE SHEET A0.0)
- ALUMINUM OR HOLLOW METAL WINDOW OR STOREFRONT TYPE (REFER TO FLOOR PLANS AND SCHEDULE SHEET A4.1)
- TOILET ACCESSORIES (SCHEDULE SHEET A1.1)
- ELEVATION KEY NOTE (SHEET A1.2)
- ROOF KEY NOTE (SHEET A1.3)
- CEILING PLAN KEY NOTE (SHEET A3.1)
- SIGNAGE KEY NOTE (SHEETS A0.0 AND A1.0)
- FEC — FIRE EXTINGUISHER CABINET, REFER TO DTLS. THIS SHEET.
- MB — MARKER BOARD
- TB — TACK BOARD
- CJ — CONTROL JOINT (SHEET A3.1)
- DF — DRINKING FOUNTAIN
- WS — WINDOW SHADES

KEY PLAN



SHERMAN CARTER BARNHART ARCHITECTS

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

FLOOR PLAN - OVERALL

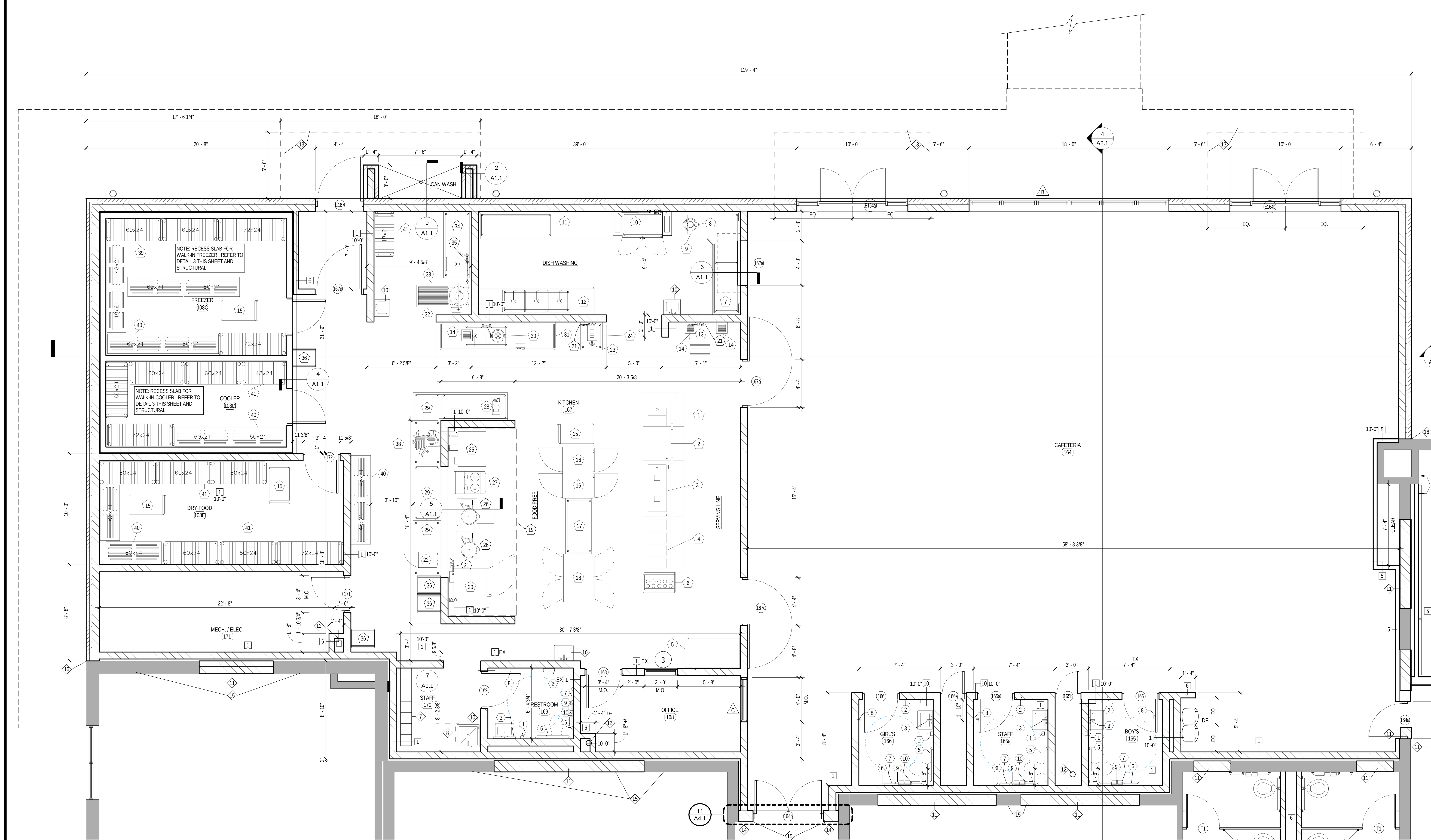
JOB NO.	2210
DATE	08 / 03 / 23
DRAWN	Author
CHECKED	TSS

REVISIONS

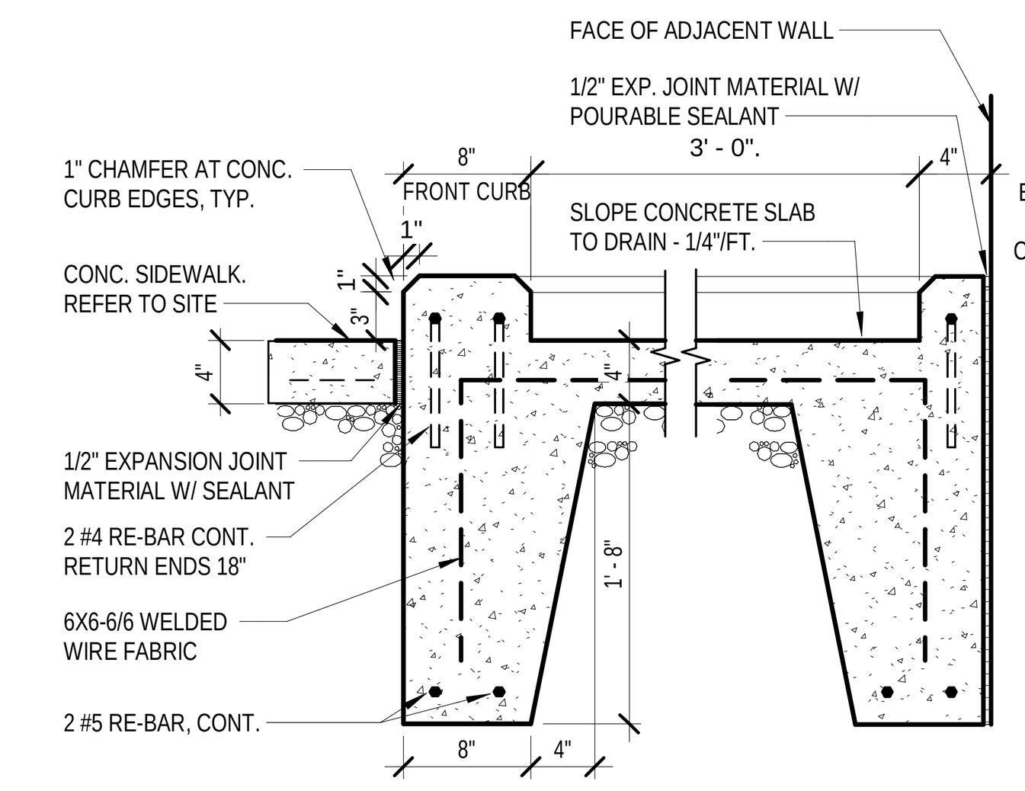
No.	Description	Date

SHEET
A1.0

2210
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/3/2023 3:02:31 PM



1 ENLARGED PLAN AREA-A
1/4" = 1'-0"



9 CAN WASH DETAIL
1" = 1'-0"

GENERAL NEW WORK NOTES

1. REFER TO MECH./ELEC. DRAWINGS FOR SPECIFIC NOTES REGARDING MECH/ELEC ITEMS NOT SHOWN ON THIS SHEET.
2. REFER TO ROOF PLAN AND MECH DRAWINGS FOR ADDITIONAL INFORMATION REGARDING WORK AT ROOF.
3. REFER TO SHEET A0.0 FOR GENERAL NOTES AND PARTITION TYPES.
4. REFER TO SHEET A1.1 FOR TOILET ACCESSORY SCHEDULE.
5. REFER TO SHEET A1.1 FOR KITCHEN EQUIPMENT SCHEDULE.

NEW WORK KEYNOTES

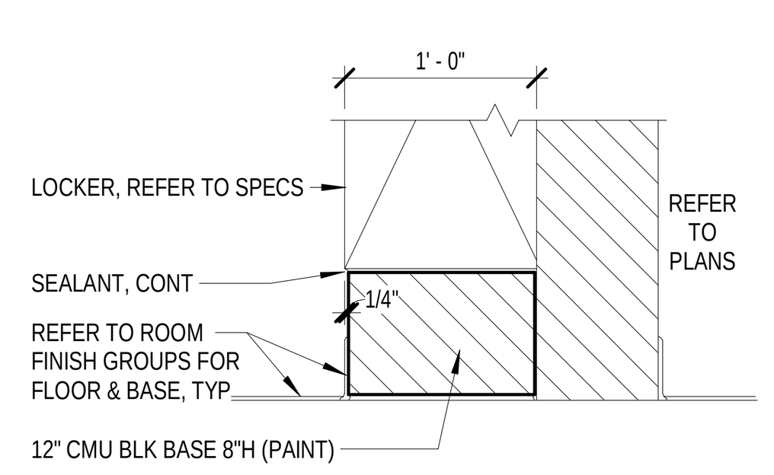
NOTE: NOT ALL KEYNOTES MAY APPLY TO THIS SHEET.

1- 6 NOT USED.

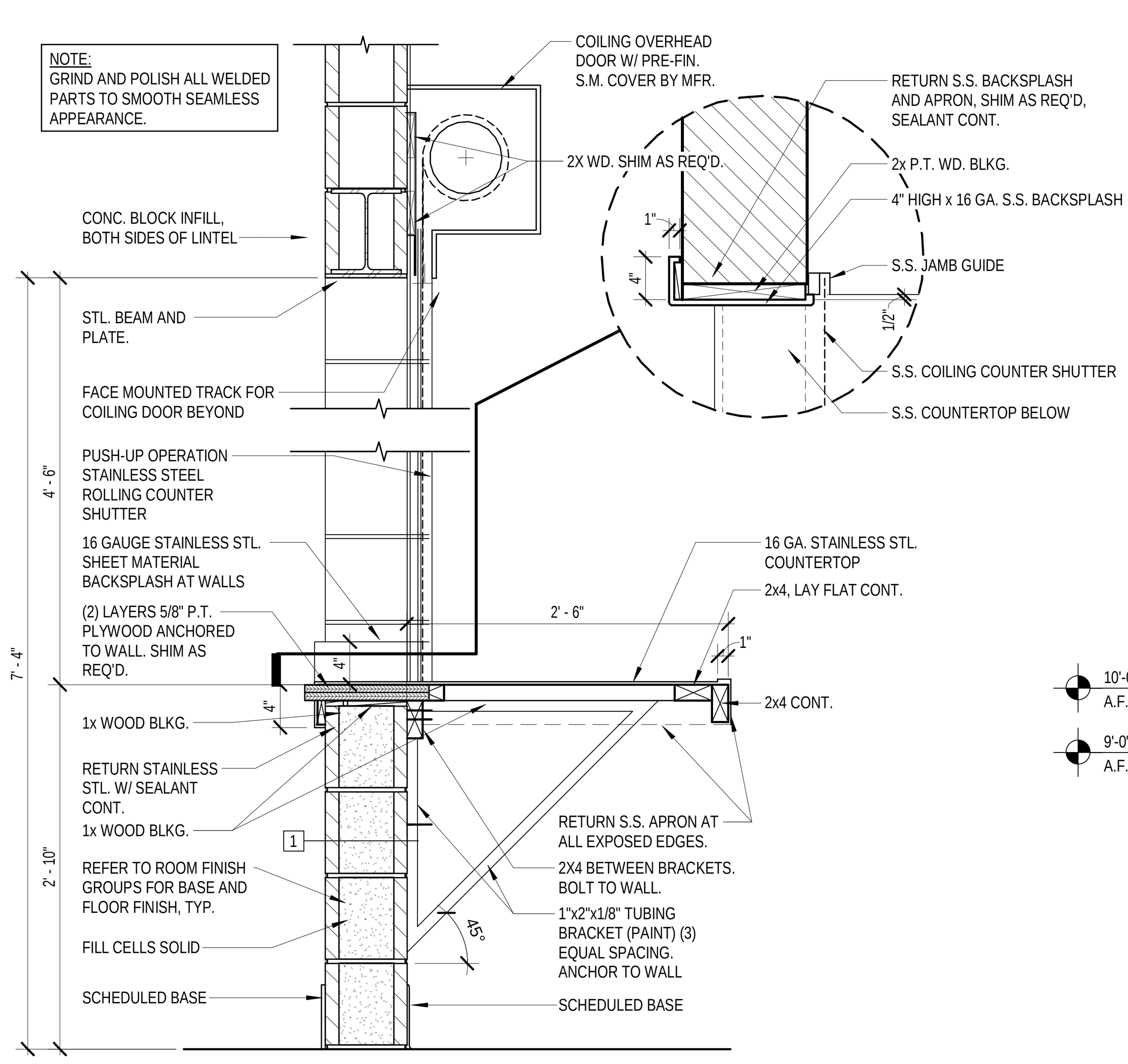
7. DOUBLE TIER METAL LOCKERS. ADD FILLER ENDS AS REQ'D FOR SYMMETRICAL INSTALLATION.
8. STACKED ADA COMPLIANT WASHER/DRYER BY OWNER.
9. TOILET PARTITION ASSEMBLY.
10. SINK, REFER TO PLUMBING.
11. INFILL EXISTING MASONRY OPENING WITH CMU TO MATCH ADJACENT. TOOTH-IN.
12. ROOF LEADER FROM ROOF DRAINS. PENETRATE WALLS AS NEEDED. CLOSE PENETRATIONS WITH BACKER ROD AND SEALANT.
13. CANOPY, REFER ROOF PLAN.
14. TOOTH-IN NEW CMU AT AREAS OF DEMOLITION.
15. PAINT ENTIRE WALL EXISTING AND NEW.
16. RAKE MORTAR BETWEEN NEW AND EXISTING MASONRY 3/8". PROVIDE BACKER ROD AND SEALANT AT BOTH INTERIOR AND EXTERIOR.
17. SECURE NEW CMU TO EXISTING WITH ISOLATION JOINT ANCHOR THAT ALLOWS INDEPENDENT MOVEMENT.
18. INFILL EXISTING MASONRY OPENING W/ CMU AND BRICK TO MATCH ADJACENT.
19. SOLID SURFACE WINDOW SILL (OVERHANG GYP. BD 1").
20. SALVAGED STONE SILL. CUT TO FIT.

SYMBOLS LEGEND

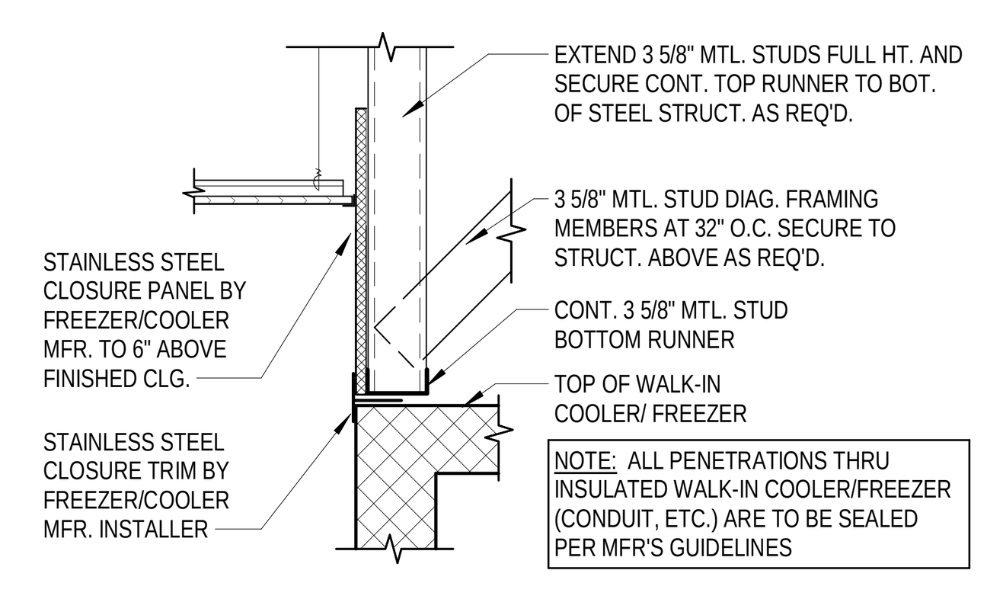
(hatch)	EXISTING CONSTRUCTION TO REMAIN. PROTECT.
Name 101 RFG #	ROOM FINISH GROUPS (REFER TO SHEET A0.0)
	ROOM NUMBER
#	DOOR NUMBER (DOOR SCHEDULE SHEET A4.1)
X	DEMOLITION WORK KEY NOTES (SHEET D1.0)
X	NEW WORK KEY NOTES (SHEETS A1.1 - A1.2)
X	WALL TYPE (SCHEDULE SHEET A0.0)
X	ALUMINUM OR HOLLOW METAL WINDOW OR STOREFRONT TYPE (REFER TO FLOOR PLANS AND SCHEDULE SHEET A4.1)
X	TOILET ACCESSORIES (SCHEDULE SHEET A1.1)
X	ELEVATION KEY NOTE (SHEET A1.2)
X	ROOF KEY NOTE (SHEET A1.3)
X	CEILING PLAN KEY NOTE (SHEET A3.1)
X	SIGNAGE KEY NOTE (SHEETS A0.0 AND A1.0)
FEC	FIRE EXTINGUISHER CABINET, REFER TO DTLS. THIS SHEET.
MB	MARKER BOARD
TB	TACK BOARD
CJ	CONTROL JOINT (SHEET A3.1)
DF	DRINKING FOUNTAIN
WS	WINDOW SHADES



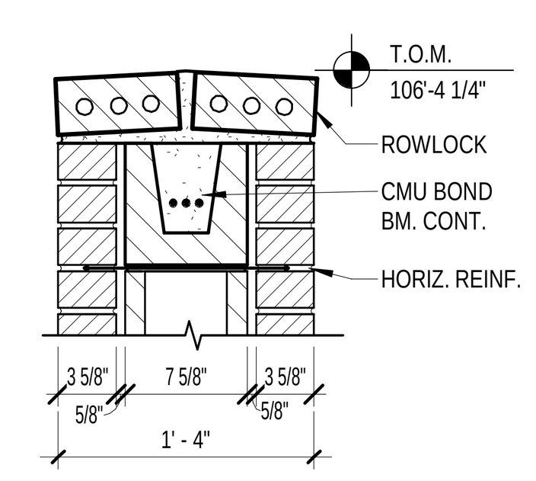
7 LOCKER BASE DETAIL
1" = 1'-0"



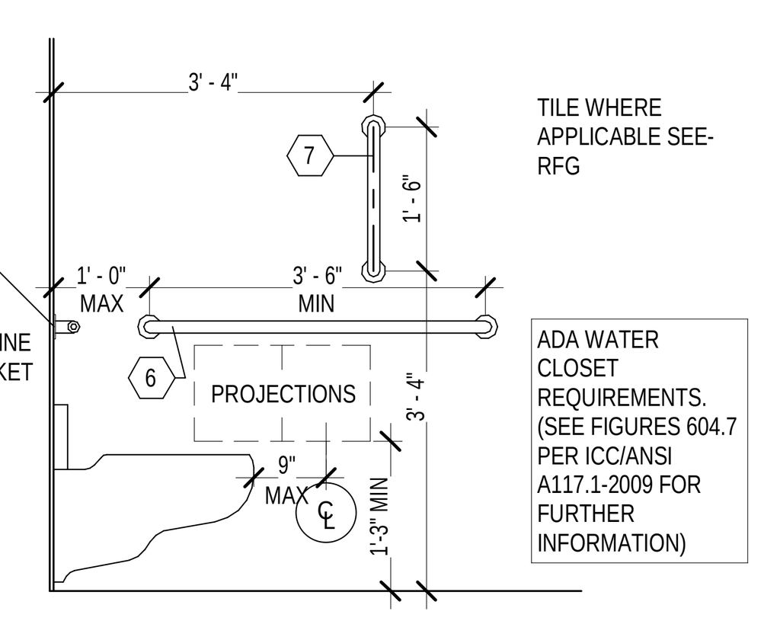
6 DISHWASH DETAIL
1" = 1'-0"



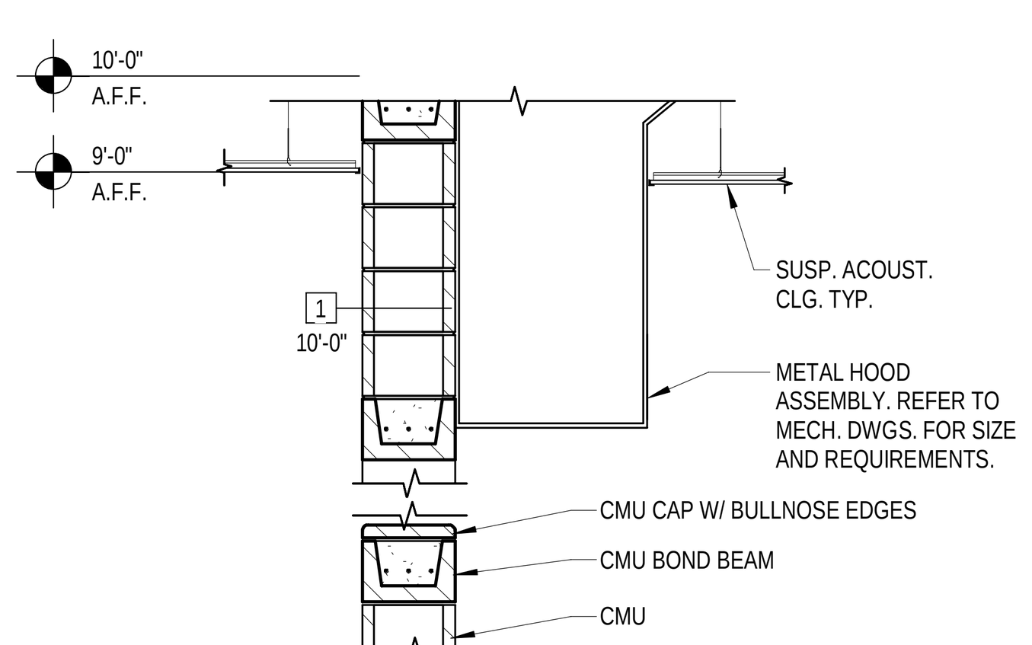
4 CEILING AT WALK-IN COOLER/FREEZER
1" = 1'-0"



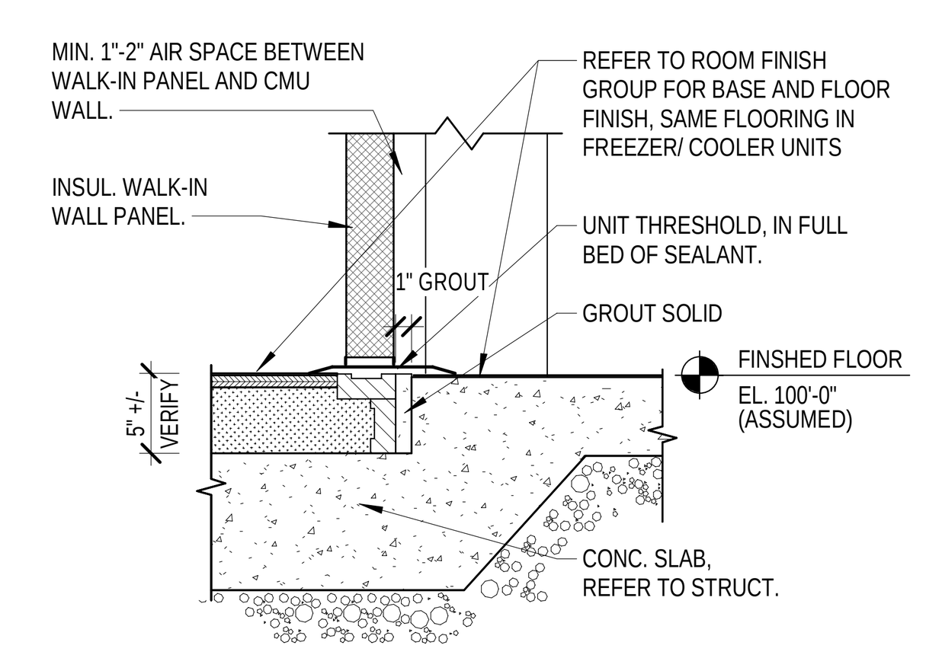
2 CAN WASH WALL
1" = 1'-0"



8 ADA GRAB BAR LAYOUT
1/2" = 1'-0"



5 EXHAUST HOOD DETAIL
1/2" = 1'-0"

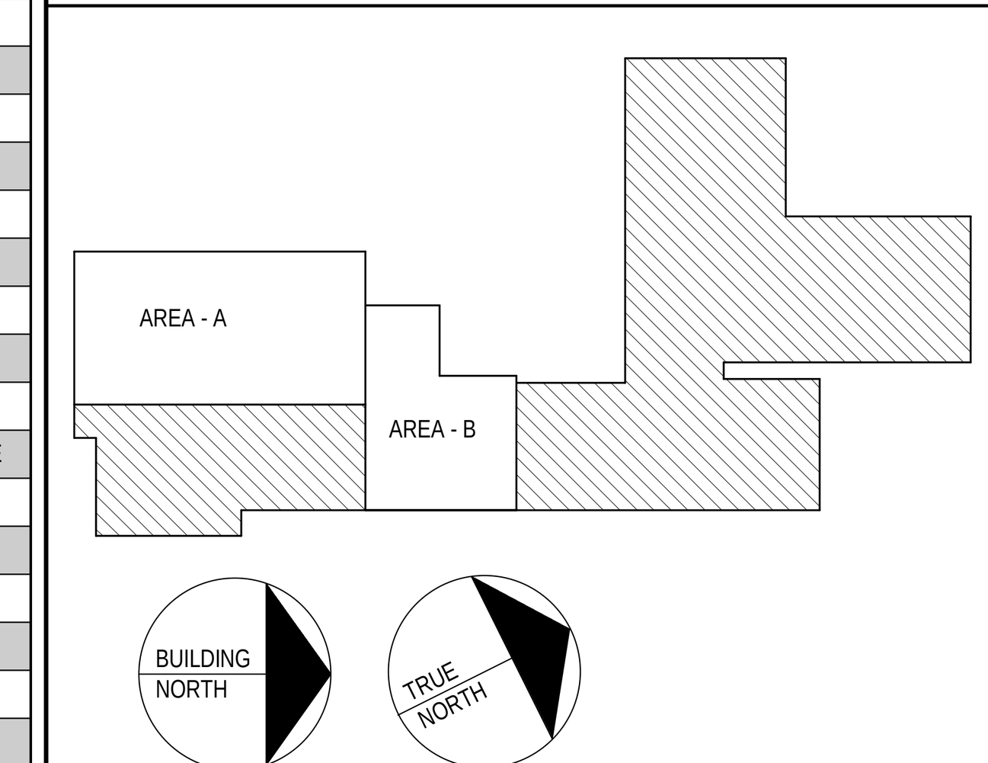


3 FLOOR DETAIL AT WALK-IN COOLER/FREEZER
1" = 1'-0"

FOOD SERVICE EQUIPMENT SCHEDULE

ITEM NO.	EQUIPMENT CATEGORY	ITEM NO.	EQUIPMENT CATEGORY
1	CASHIER COUNTER	22	OVEN, MICROWAVE
2	SOLID TOP COUNTER	23	HOT WATER DISPENSER
3	COLD FOOD COUNTER	24	WORK TABLE CUSTOM
4	HOT FOOD COUNTER	25	CONVECTION OVEN
5	MILK COOLER	26	12 GAL. STEAM JACKETED KETTLE
6	TRAY & SILVER CART	27	ELECTRIC RANGE
7	SOILED DISH TABLE	28	FOOD PROCESSOR
8	GARBAGE DISPOSER	29	WORK TABLE
9	HOSE REEL WITH SPRAY	30	GARBAGE DISPOSER
10	DISHWASHER	31	WORK TABLE W/ SINK
11	CLEAN DISH TABLE	32	CUTTER/MIXER, VERTICAL
12	THREE COMPARTMENT SINK	33	FLOOR TROUGH
13	ICE MAKER & BIN	34	WORK TABLE W/ SINK
14	FLOOR SINK	35	FAUCET, WALL MOUNT, WITH PRE-RINSE
15	UTILITY CARTS	36	RACK, PAN
16	PASS THRU HOLDING/PROOFING CABINET	37	NOT USED
17	WORK TABLE	38	FOOD SLICER
18	PASS THRU REFRIGERATOR	39	WALK IN SHELVING
19	EXHAUST HOOD SYSTEM	40	DUNNAGE RACK
20	COMBI OVEN (DOUBLE STACK)	41	STORAGE SHELVING
21	WATER FILTER		

KEY PLAN



SHERMAN CARTER BARNHART ARCHITECTS

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ENLARGED PLAN AND DETAILS

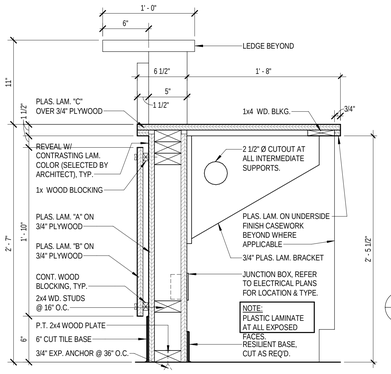
JOB NO.	2210
DATE	08 / 03 / 23
DRAWN	Author
CHECKED	TSS

REVISIONS

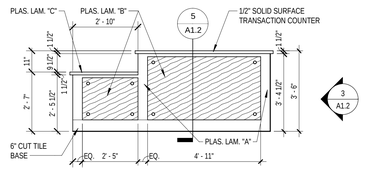
No.	Description	Date

SHEET
A1.1

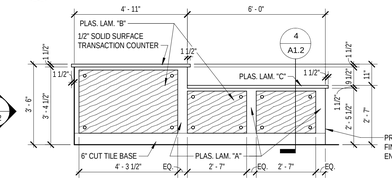
2210
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/4/2023 11:05:48 AM



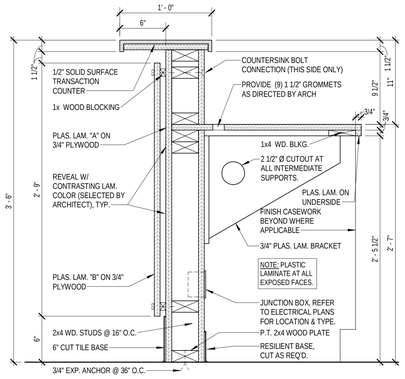
4 ADMIN DESK SECTION (B)
1 1/2" = 1'-0"



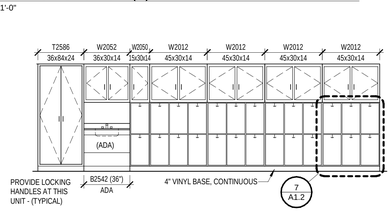
2 DESK ELEVATION-A
3/8" = 1'-0"



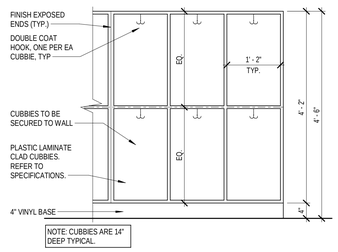
3 DESK ELEVATION-B
3/8" = 1'-0"



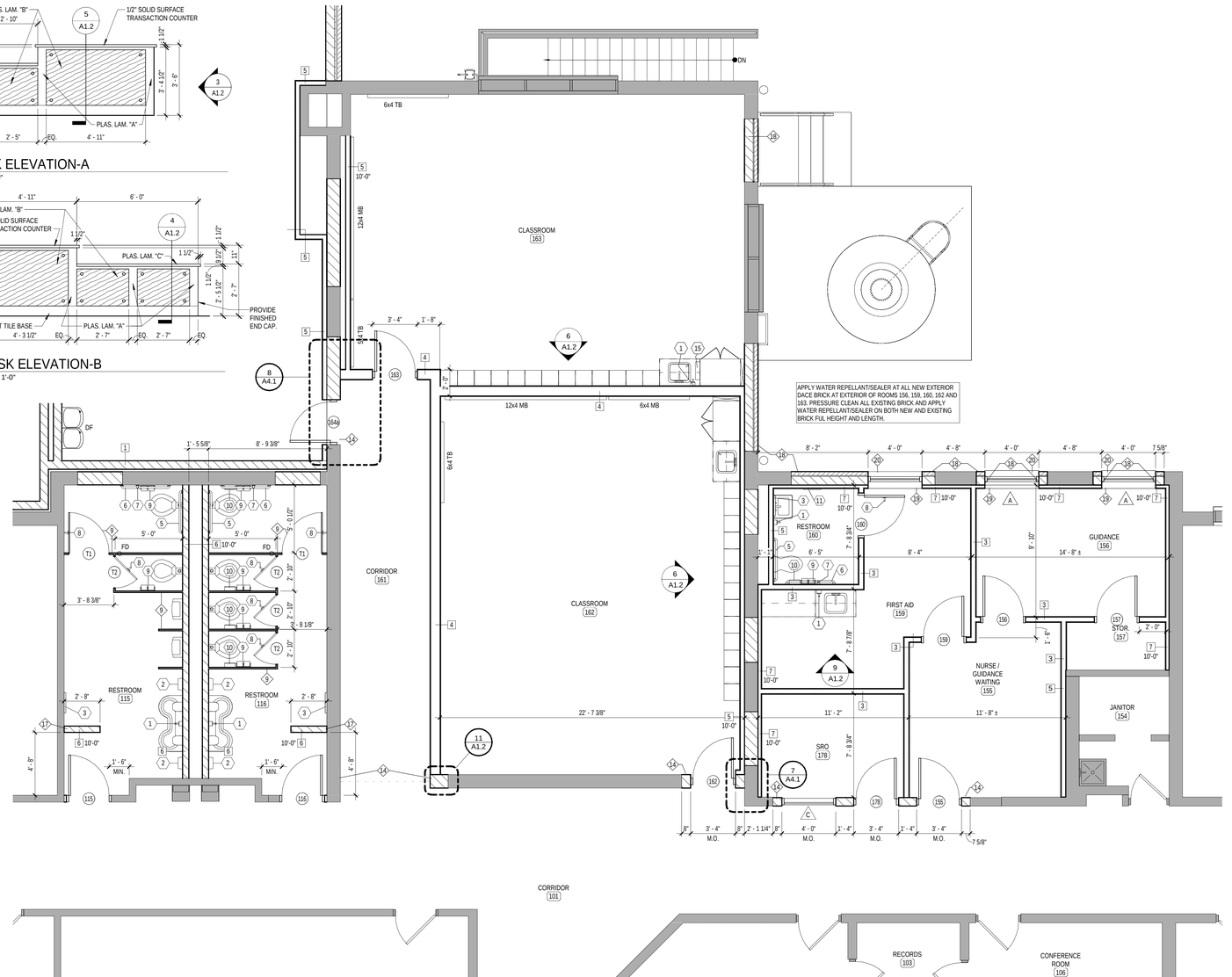
5 ADMIN DESK SECTION (A)
1 1/2" = 1'-0"



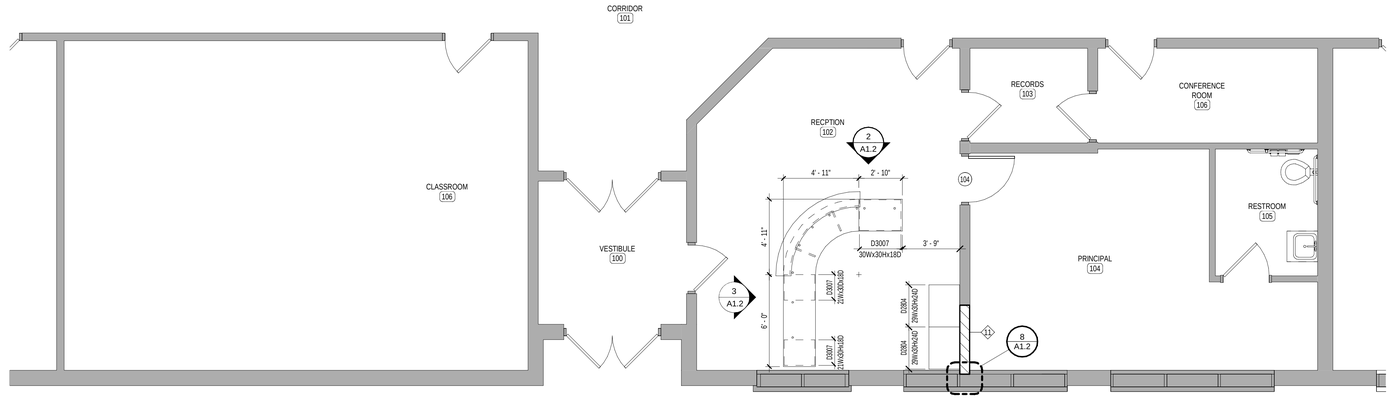
6 CUBBIE ELEVATION
1/4" = 1'-0"

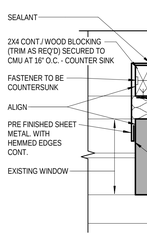


7 CUBBIE DETAIL
3/4" = 1'-0"

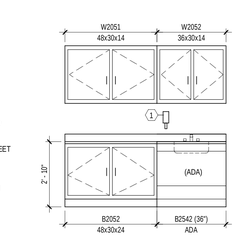


1 ENLARGED PLAN AREA-B
1/4" = 1'-0"

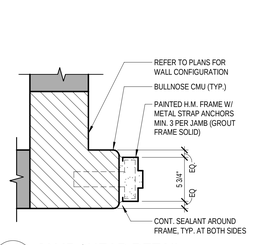




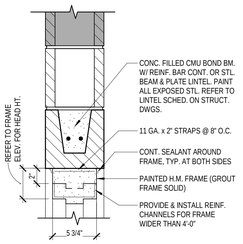
8 DETAIL
1 1/2" = 1'-0"

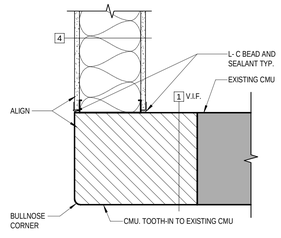


9 CASEWORK ELEVATION
3/8" = 1'-0"



10 JAMB / HEAD DETAIL
1 1/2" = 1'-0"





11 DETAIL
1 1/2" = 1'-0"

TOILET ACCESSORY SCHEDULE

-	ACCESSORY	MTG. HT.	MFR./MODEL #
1	S.S. SOAP DISPENSER	40" TO VALVE	N.I.C., OWNER FURNISHED, CONTRACTOR INSTALLED
2	SENSOR FACED ELECTRIC HAND DRYER (SURFACE MTD.)	40" TO BUTTON CENTERLINE	WORLD HAND DRYER
3	MIRROR W/ S.S. FRAME - 18"x36"	40" TO BOTTOM	ASI 0600
4	NOT USED	NOT USED	NOT USED
5	36" S.S. GRAB BAR (1-1/4")	33" TO CENTERLINE	ASI 3100 SERIES, REFER TO DETAIL 8 THIS SHEET
6	42" S.S. GRAB BAR (1-1/4")	33" TO CENTERLINE	ASI 3100 SERIES, REFER TO DETAIL 8 THIS SHEET
7	18" VERTICAL S.S. GRAB BAR (1-1/4")	REFER TO GRAB BAR LAYOUT 8/A1.1	ASI 3100 SERIES
8	CLOTHES HOOK (SURFACE MOUNTED)	48" TO CENTER	ASI 8425
9	TOILET PAPER DISPENSER	23" TO CENTERLINE	N.I.C., OWNER FURNISHED, CONTRACTOR INSTALLED
10	SANITARY NAPKIN DISPOSAL	24" TO TOP	ASI 0852
11	PAPER TOWEL DISPENSER (SURFACE MOUNTED)	44" TO SLOT	ASI 0210

GENERAL NEW WORK NOTES

1. REFER TO MECH./ELEC. DRAWINGS FOR SPECIFIC NOTES REGARDING MECH/ELEC ITEMS NOT SHOWN ON THIS SHEET.
2. REFER TO ROOF PLAN AND MECH DRAWINGS FOR ADDITIONAL INFORMATION REGARDING WORK AT ROOF.
3. REFER TO SHEET A0.0 FOR GENERAL NOTES AND PARTITION TYPES.
4. REFER TO SHEET A1.1 FOR TOILET ACCESSORY SCHEDULE.
5. REFER TO SHEET A1.1 FOR KITCHEN EQUIPMENT SCHEDULE.

NEW WORK KEYNOTES

NOTE: NOT ALL KEYNOTES MAY APPLY TO THIS SHEET.

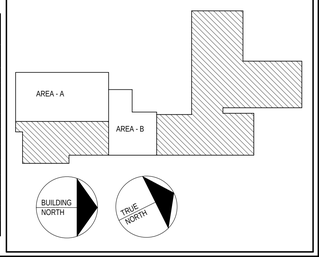
1- 6 NOT USED.

7. DOUBLE TIER METAL LOCKERS. ADD FILLER ENDS AS REQ'D FOR SYMMETRICAL INSTALLATION.
8. STACKED ADA COMPLIANT WASHER/DRYER BY OWNER.
9. TOILET PARTITION ASSEMBLY.
10. SINK, REFER TO PLUMBING.
11. INFILL EXISTING MASONRY OPENING WITH CMU TO MATCH ADJACENT. TOOTH-IN.
12. ROOF LEADER FROM ROOF DRAINS. PENETRATE WALLS AS NEEDED. CLOSE PENETRATIONS WITH BACKER ROD AND SEALANT.
13. CANOPY, REFER ROOF PLAN.
14. TOOTH-IN NEW CMU AT AREAS OF DEMOLITION.
15. PAINT ENTIRE WALL EXISTING AND NEW.
16. RAKE MORTAR BETWEEN NEW AND EXISTING MASONRY 3/8". PROVIDE BACKER ROD AND SEALANT AT BOTH INTERIOR AND EXTERIOR.
17. SECURE NEW CMU TO EXISTING WITH ISOLATION JOINT ANCHOR THAT ALLOWS INDEPENDENT MOVEMENT.
18. INFILL EXISTING MASONRY OPENING W/ CMU AND BRICK TO MATCH ADJACENT.
19. SOLID SURFACE WINDOW SILL (OVERHANG GYP. BD 1").
20. SALVAGED STONE SILL. CUT TO FIT.

SYMBOLS LEGEND

- EXISTING CONSTRUCTION TO REMAIN. PROTECT.
- Name 101 # — ROOM FINISH GROUPS (REFER TO SHEET A0.0)
- ROOM NUMBER
- # — DOOR NUMBER (DOOR SCHEDULE SHEET A4.1)
- X — DEMOLITION WORK KEY NOTES (SHEET D1.0)
- X — NEW WORK KEY NOTES (SHEETS A1.1 - A1.2)
- X — WALL TYPE (SCHEDULE SHEET A0.0)
- X — ALUMINUM OR HOLLOW METAL WINDOW OR STOREFRONT TYPE (REFER TO FLOOR PLANS AND SCHEDULE SHEET A4.1)
- X — TOILET ACCESSORIES (SCHEDULE SHEET A1.1)
- X — ELEVATION KEY NOTE (SHEET A1.2)
- X — ROOF KEY NOTE (SHEET A1.3)
- X — CEILING PLAN KEY NOTE (SHEET A3.1)
- X — SIGNAGE KEY NOTE (SHEETS A0.0 AND A1.0)
- FEC — FIRE EXTINGUISHER CABINET, REFER TO DTLS. THIS SHEET.
- MB — MARKER BOARD
- TB — TACK BOARD
- CJ — CONTROL JOINT (SHEET A3.1)
- DF — DRINKING FOUNTAIN
- WS — WINDOW SHADES

KEY PLAN



SHERMAN CARTER BARNHART ARCHITECTS

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277

HART COUNTY BOARD OF EDUCATION

HORSE CAVE, KY

ENLARGED PLAN AND DEATILS

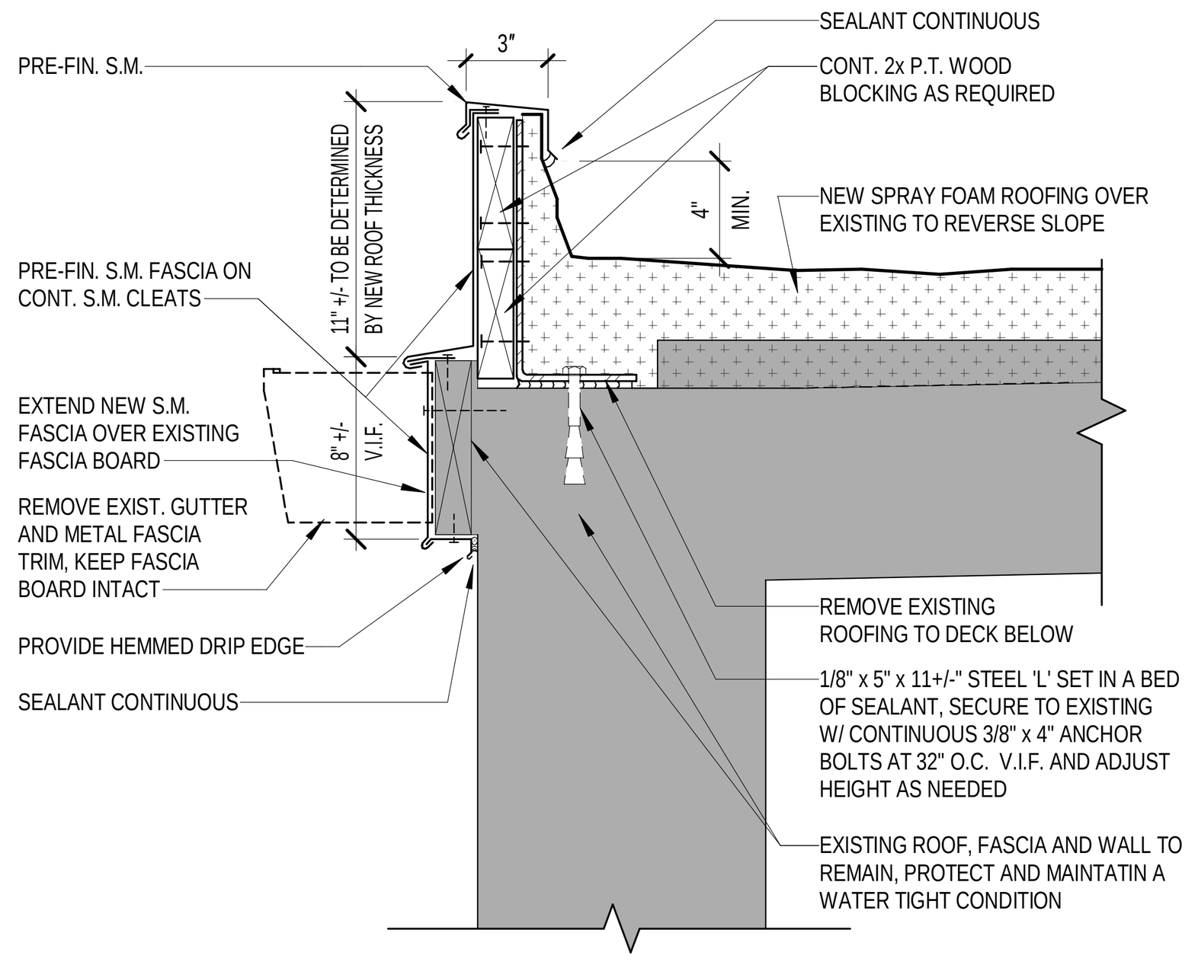
JOB NO.	2210
DATE	08 / 03 / 23
DRAWN	TM
CHECKED	TSS

REVISIONS

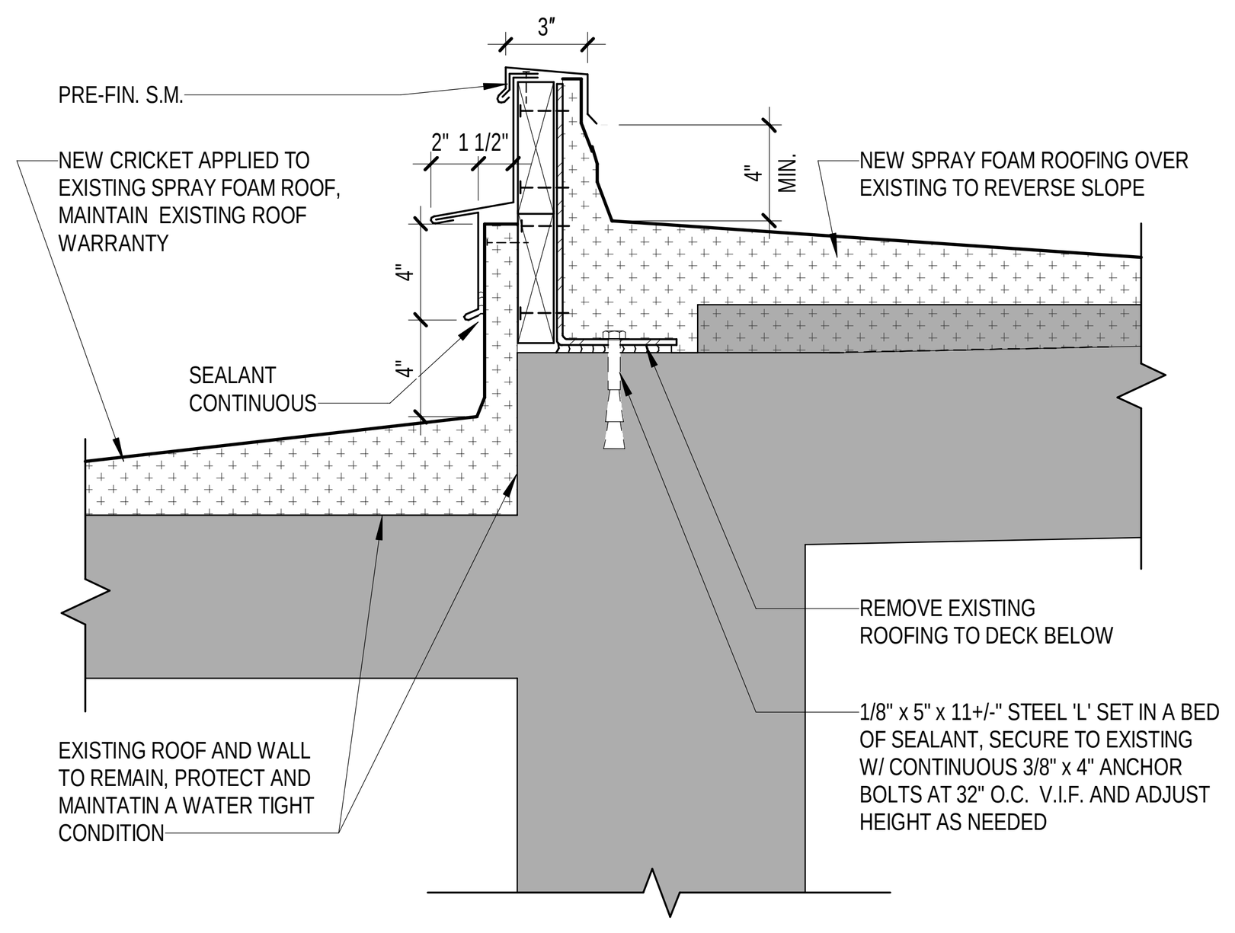
No.	Description	Date

SHEET

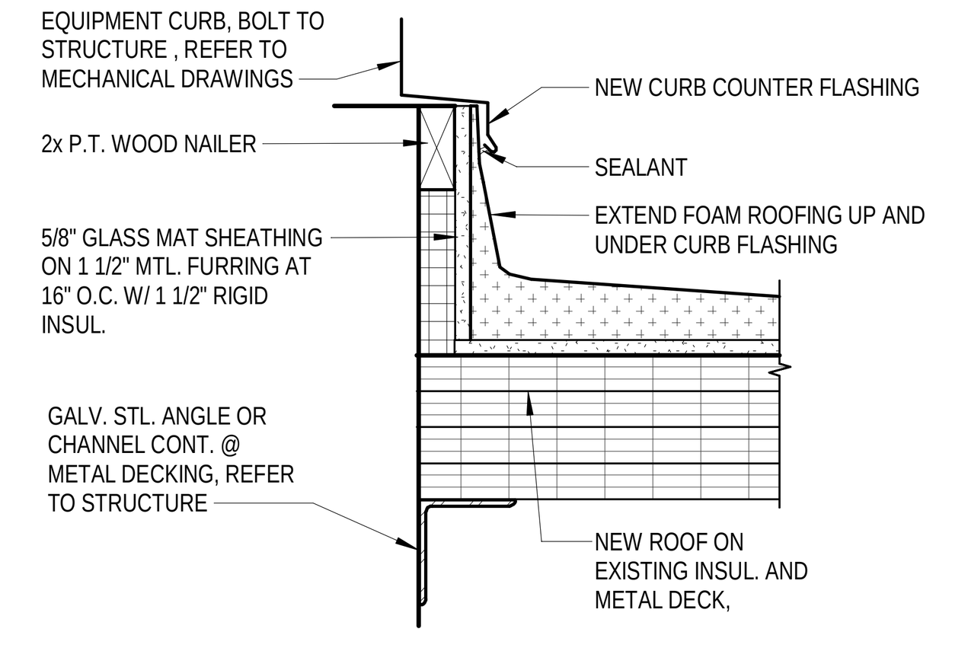
A1.2



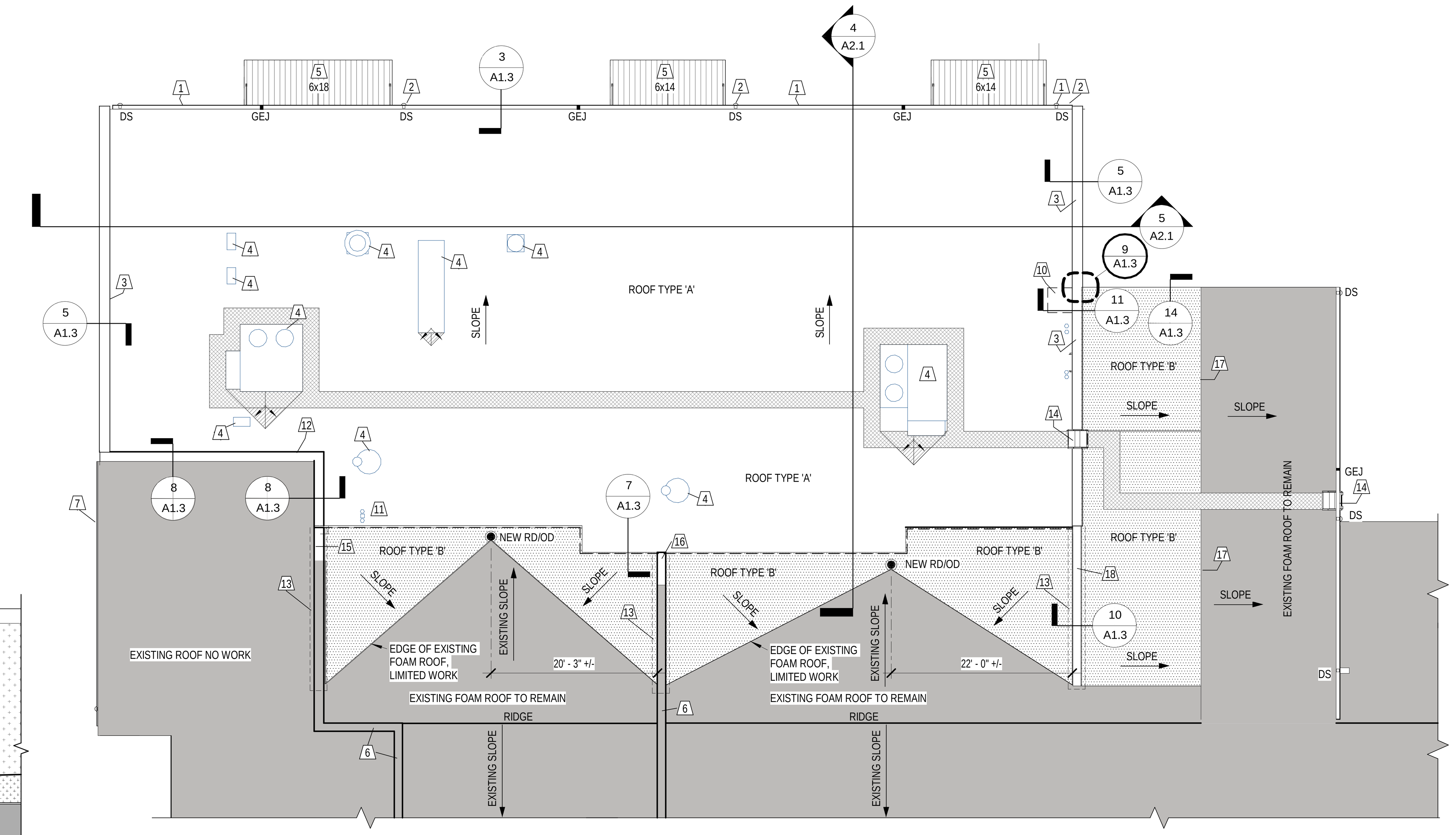
14 DETAIL
1 1/2" = 1'-0"



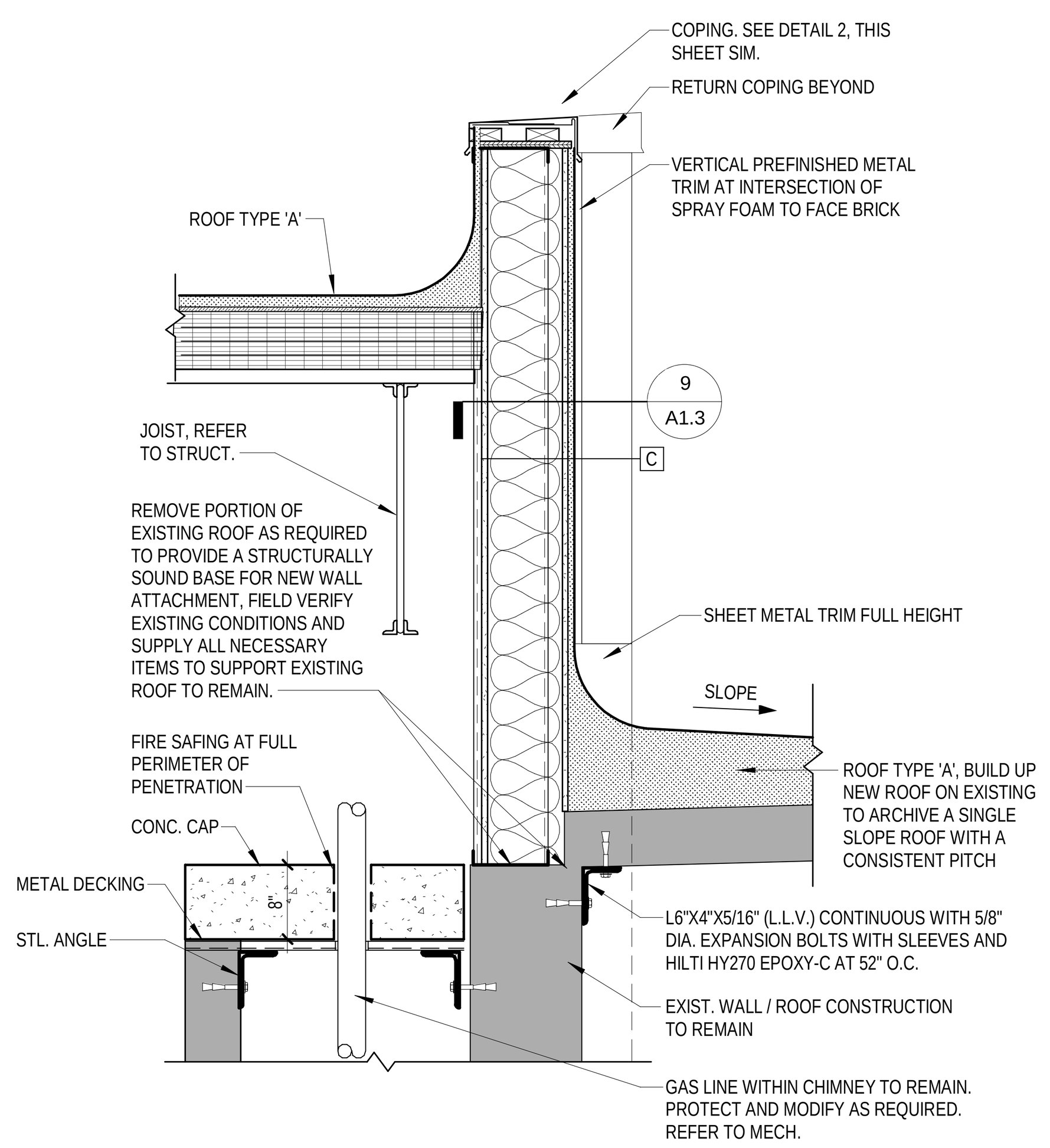
10 DETAIL
1 1/2" = 1'-0"



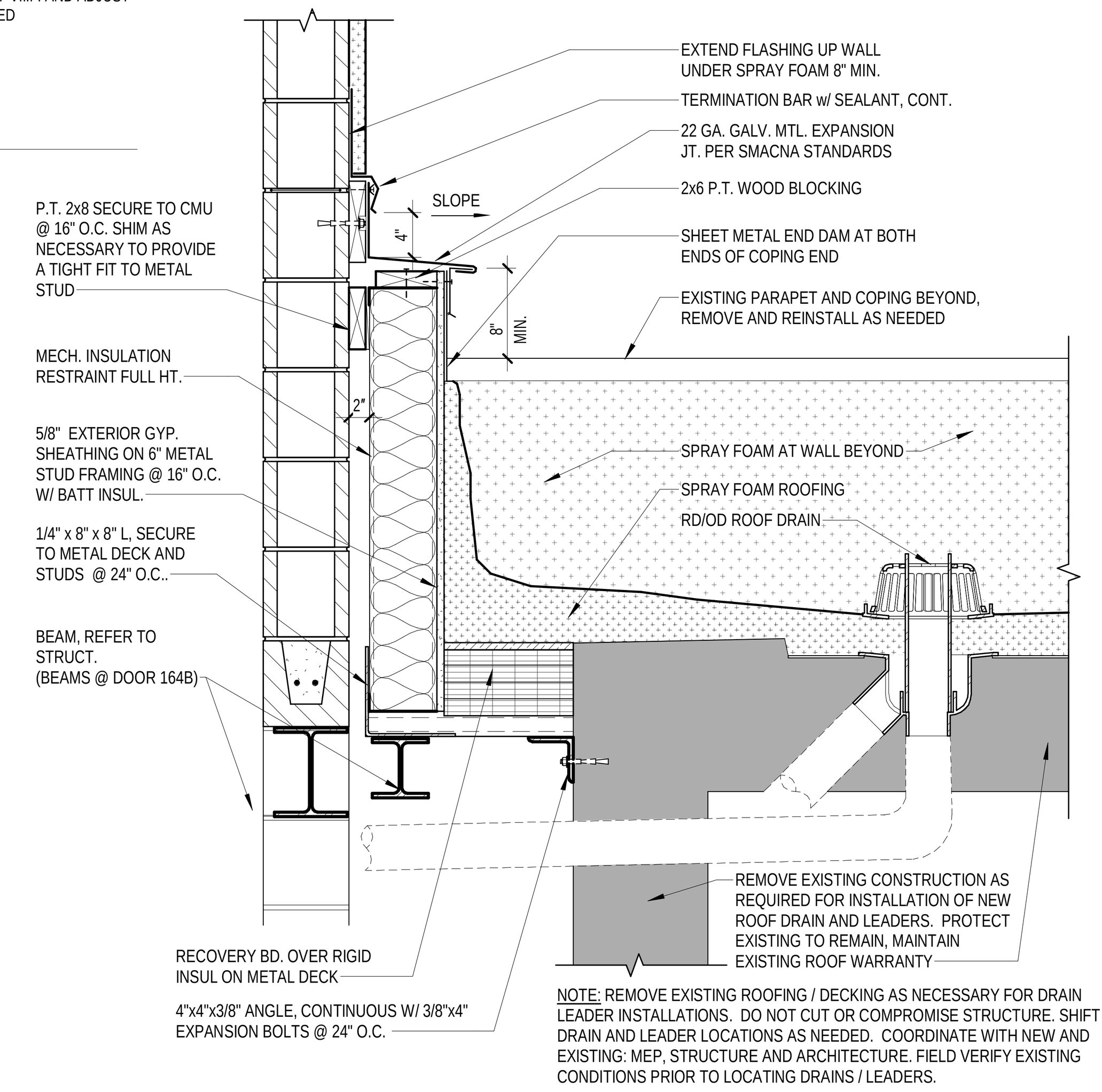
6 TYPICAL MECHANICAL CURB DETAIL
1 1/2" = 1'-0"



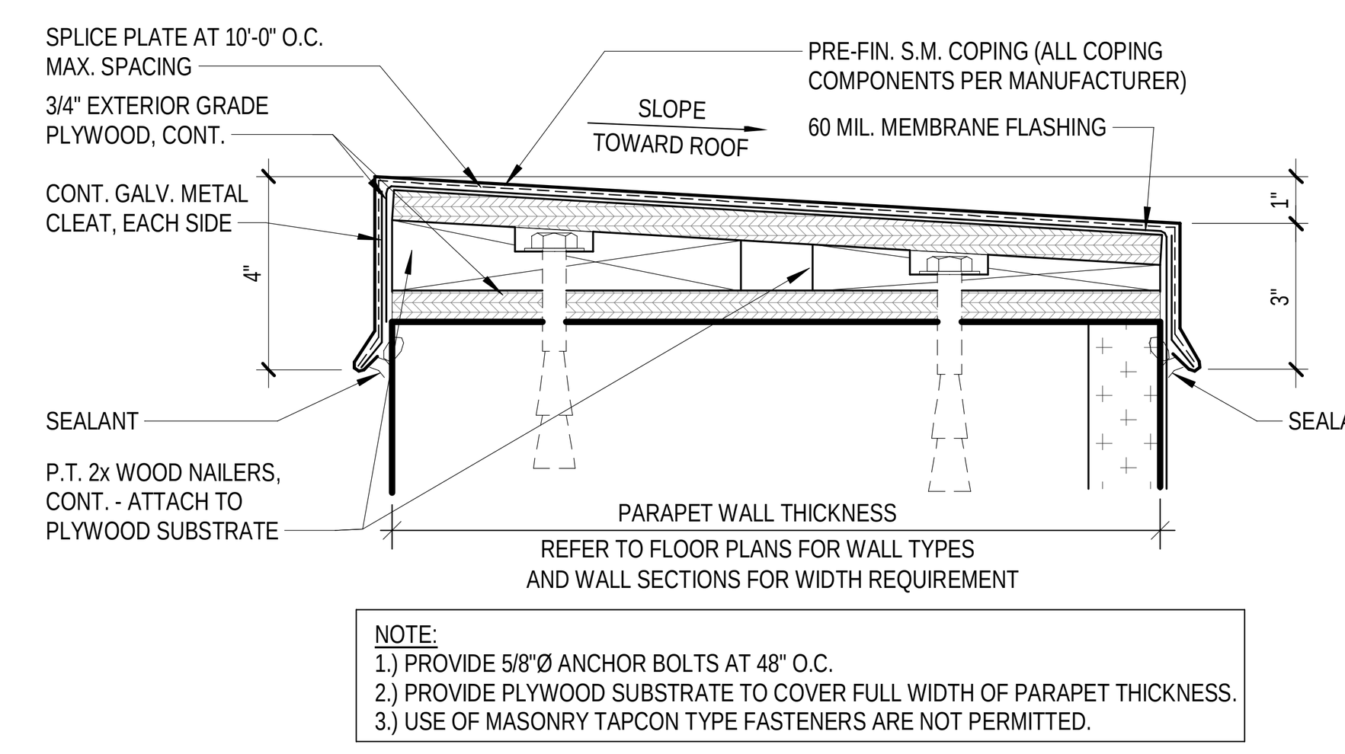
1 ROOF PLAN
3/32" = 1'-0"



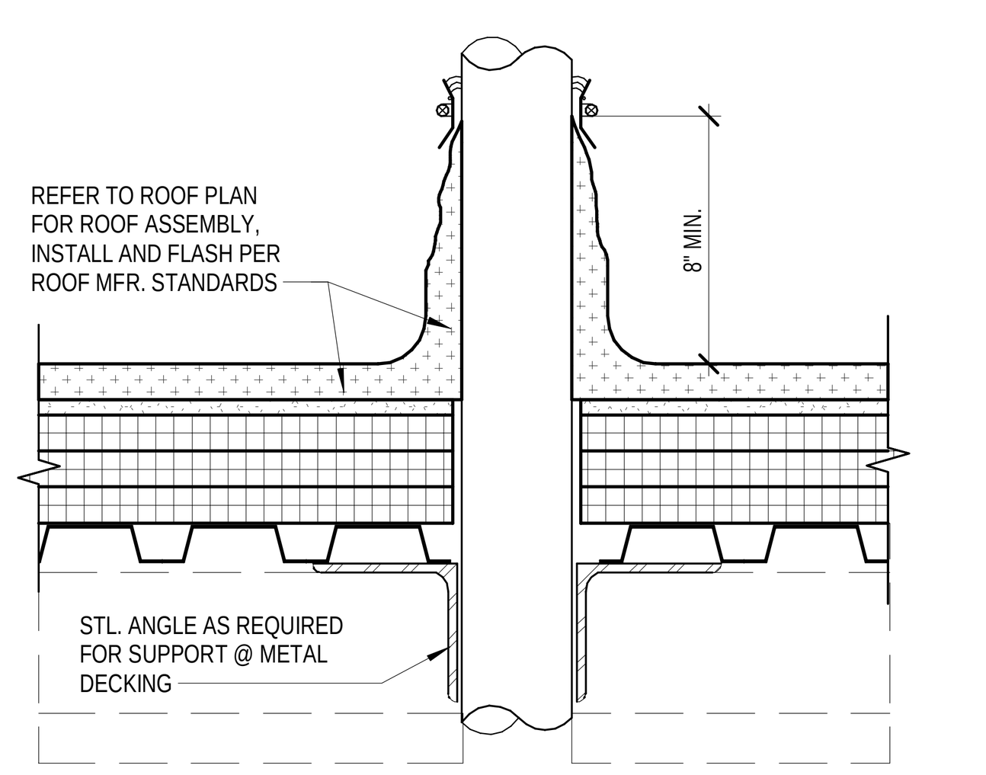
11 ROOF DETAIL
3/4" = 1'-0"



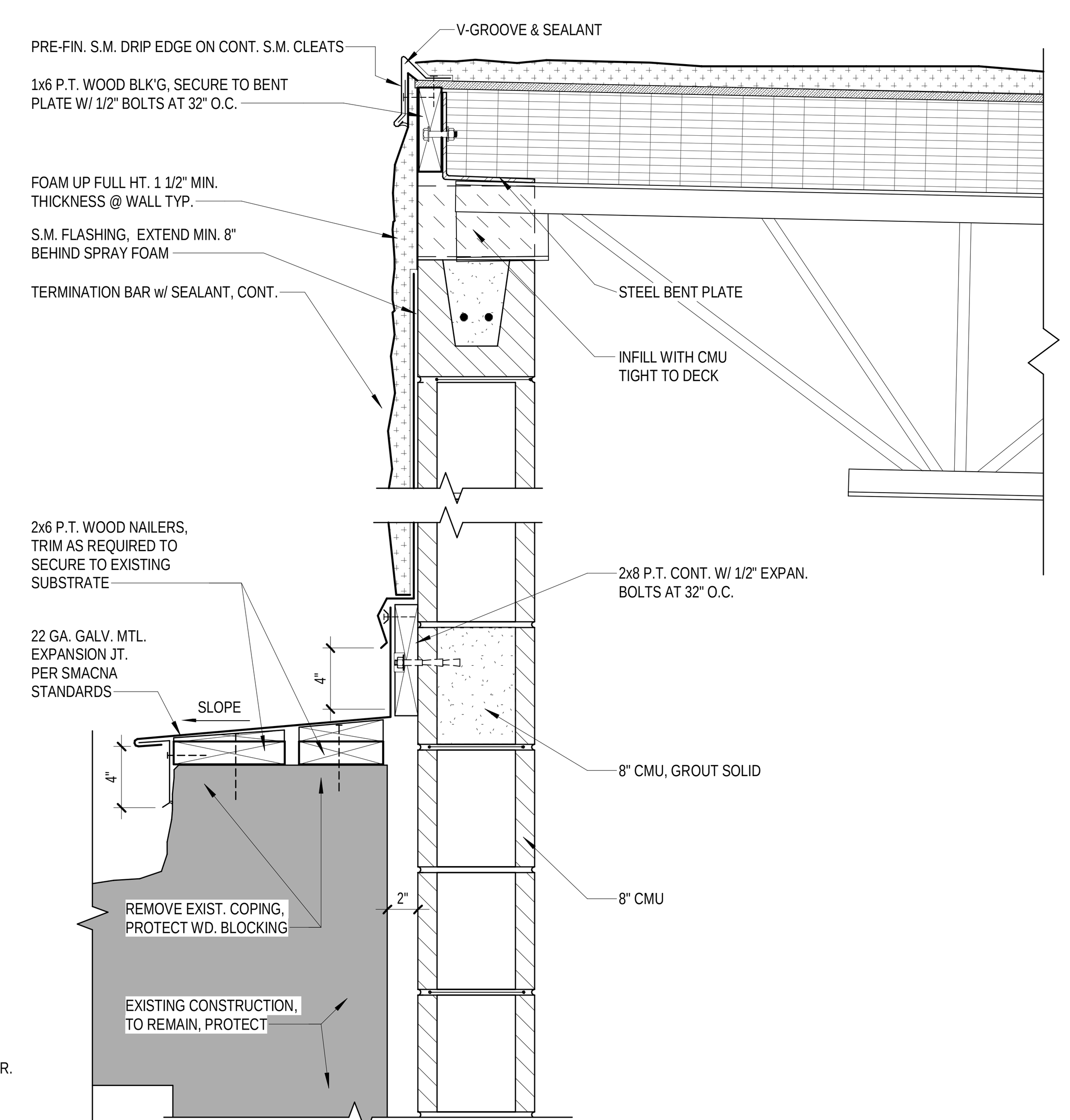
7 DETAIL
1" = 1'-0"



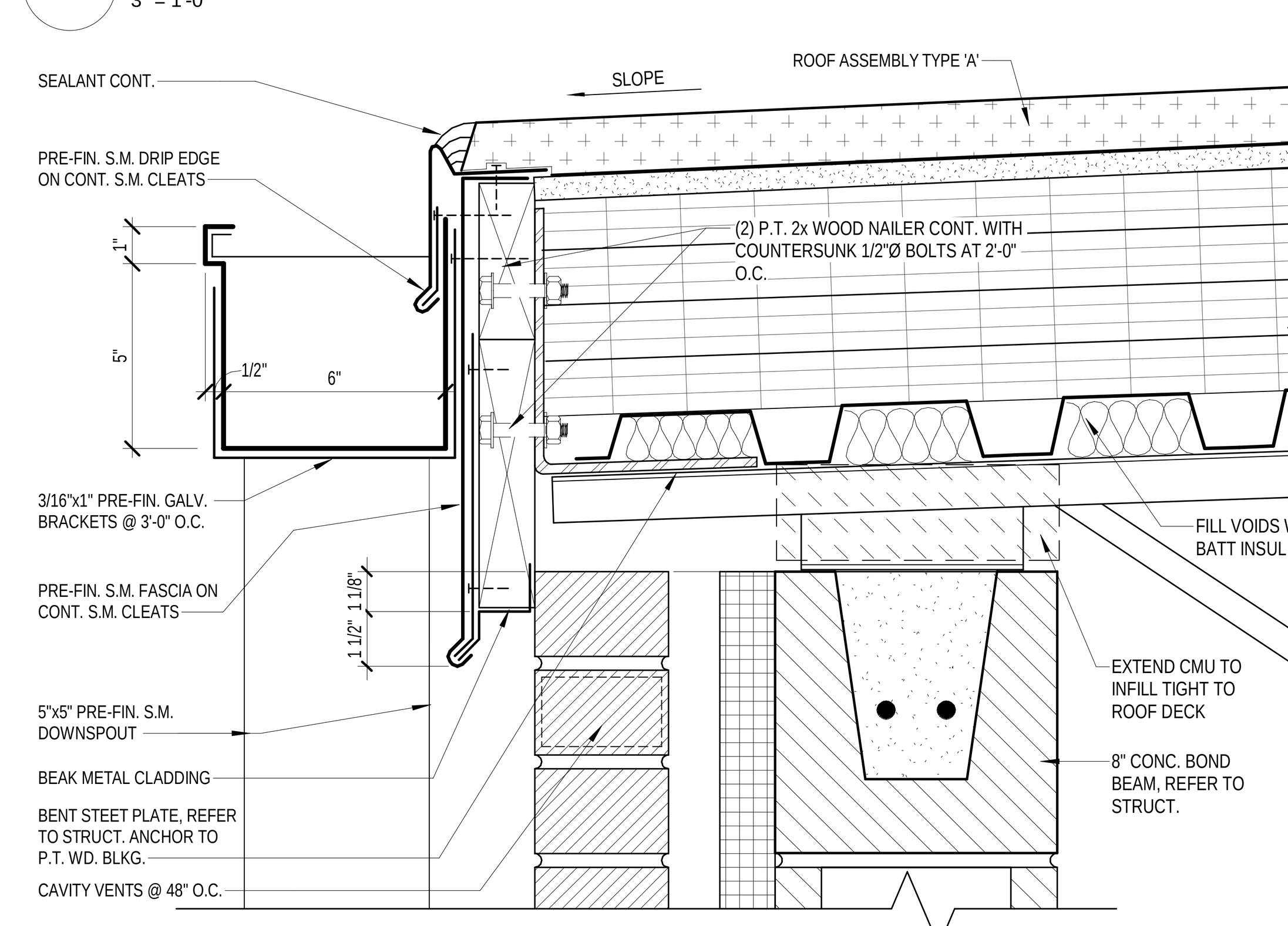
2 COPING DETAIL
3" = 1'-0"



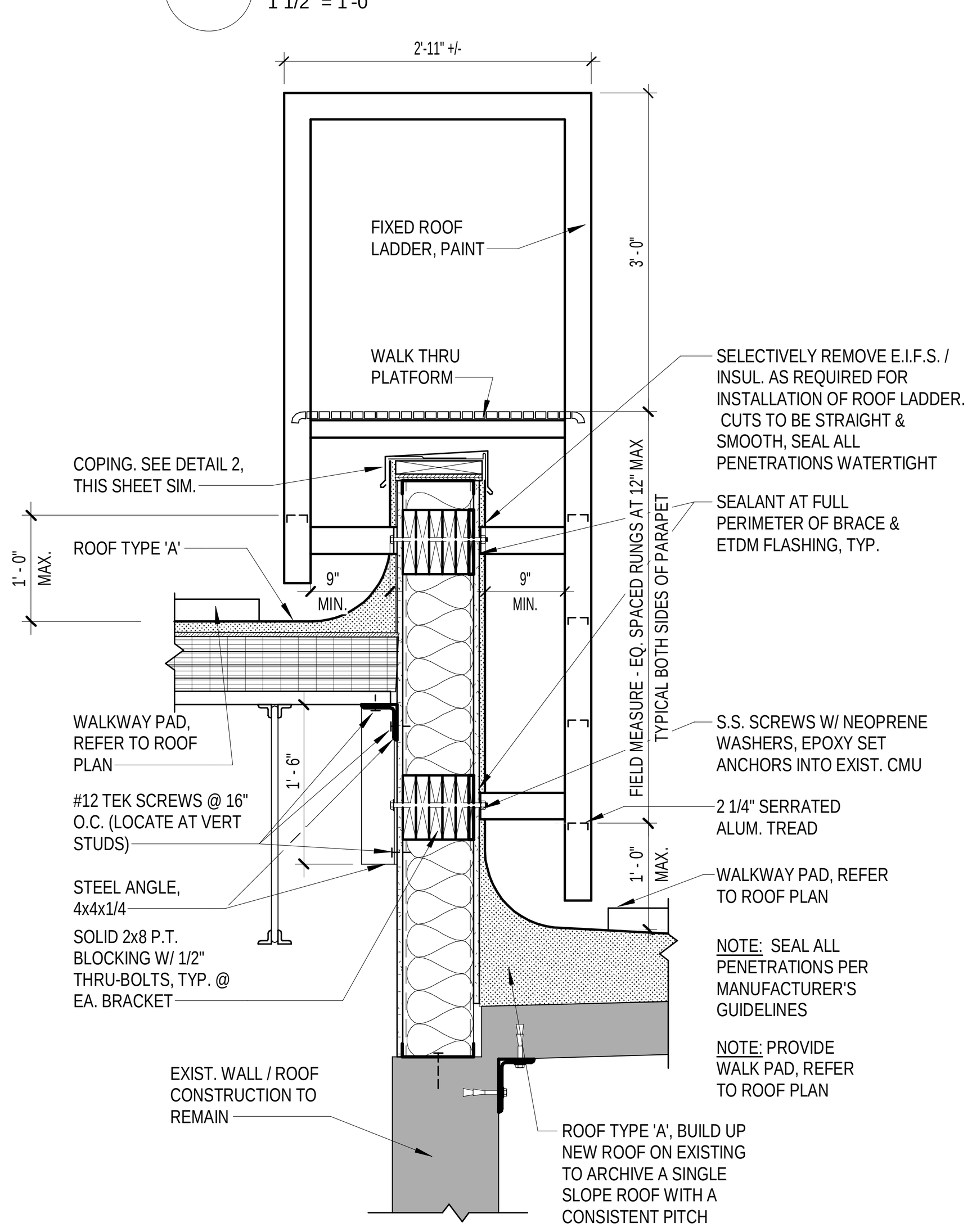
12 TYPICAL ROOF PENETRATION DETAIL
1 1/2" = 1'-0"



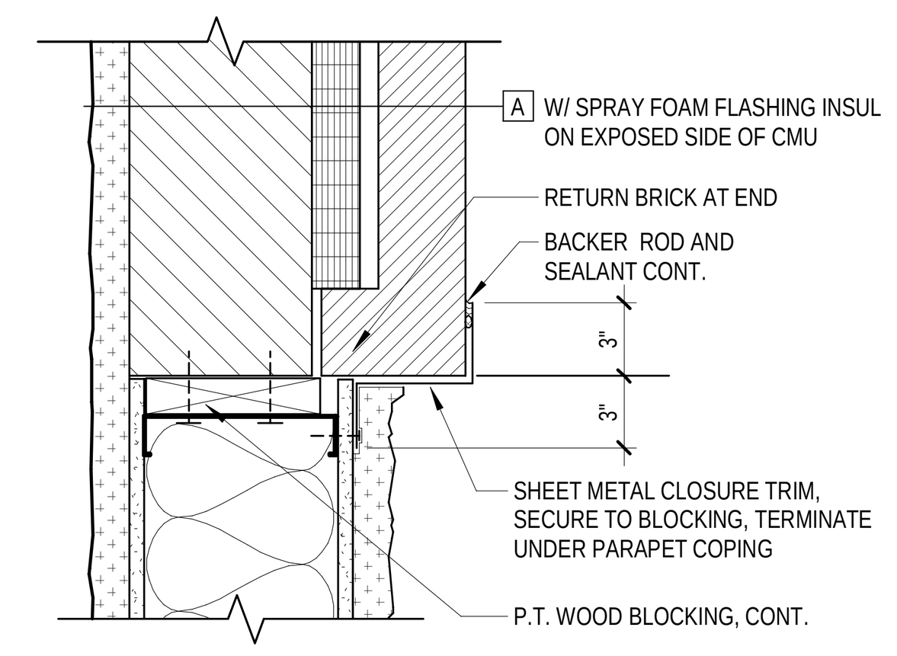
8 DETAIL
1 1/2" = 1'-0"



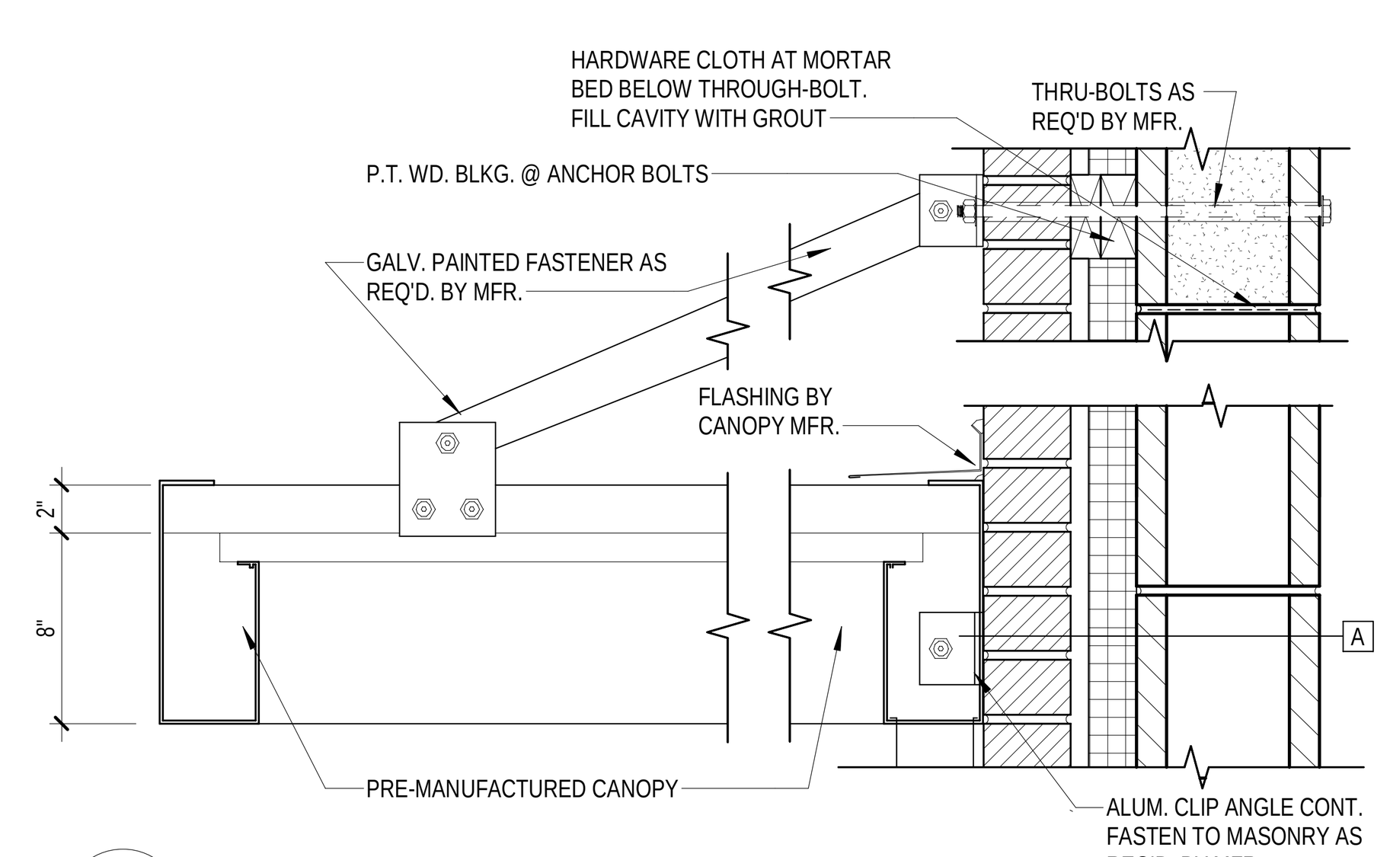
3 ROOF DETAIL
3" = 1'-0"



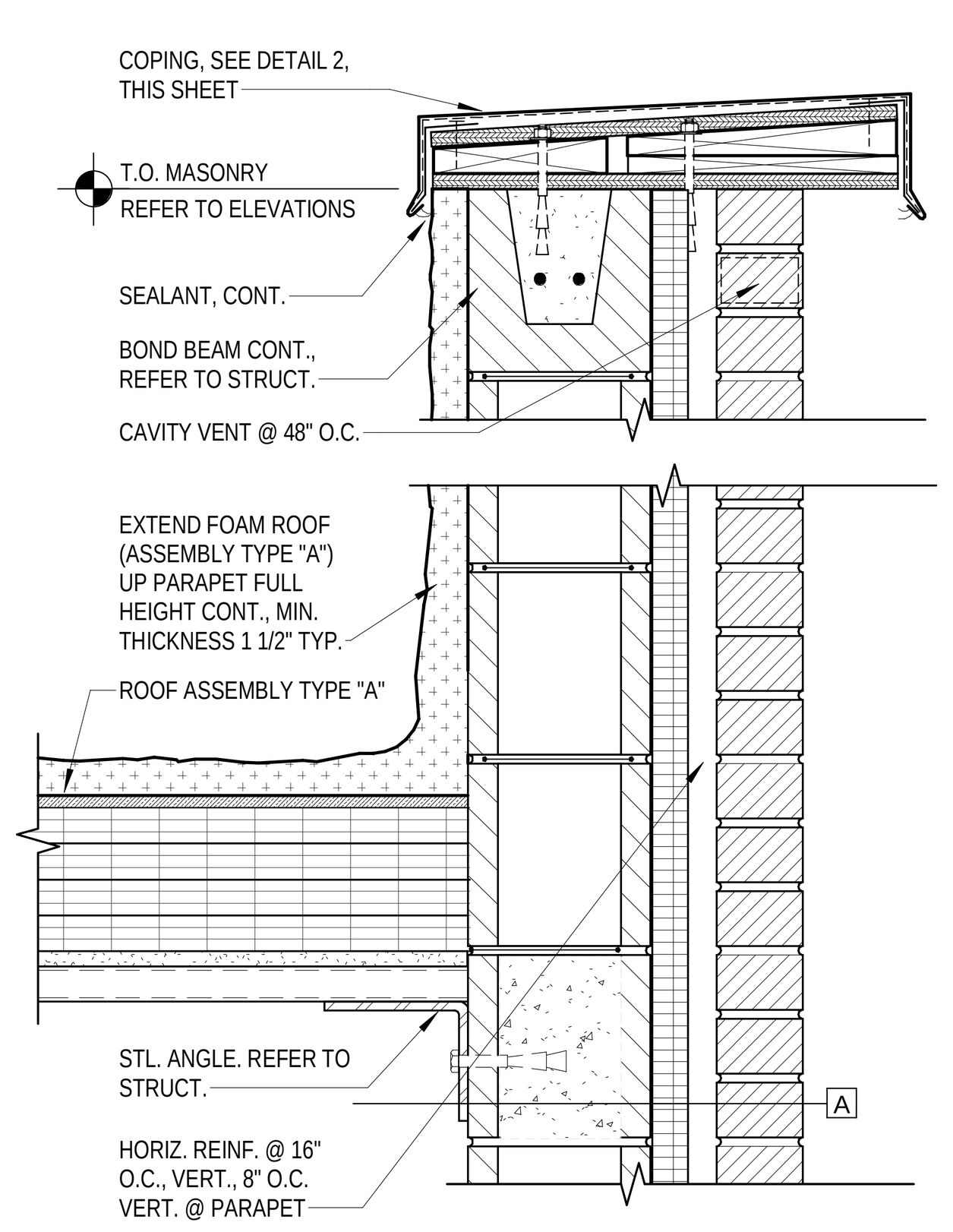
13 ROOF LADDER DETAIL
3/4" = 1'-0"



9 ROOF DETAIL
1 1/2" = 1'-0"



4 DETAIL
1 1/2" = 1'-0"



5 ROOF DETAIL
1 1/2" = 1'-0"

GENERAL ROOF NOTES

A. REFER TO STRUCTURAL DRAWINGS FOR SPECIFIC STRUCTURAL ELEVATIONS.

B. REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR ADDITIONAL ROOF MECH/ELEC ITEMS THAT MAY NOT BE SHOWN ON THIS PLAN.

C. FLASH ALL ROOF PENETRATIONS PER MANUFACTURER'S STANDARD DETAILS, U.N.O.

D. THE ROOFING CONTRACTOR SHALL NOT CONCEAL ANY WEEPS, BRICK VENTS, EXPANSION JOINTS, OR FLASHINGS. ROOFING SHALL TERMINATE AS SHOWN ON DETAILS.

E. THE CONTRACTOR SHALL COORDINATE INSTALLATION OF ROOFING/FLASHING WITH OTHER TRADES FOR ADDITIONAL WORK REQUIRED.

F. INSTALL CRICKETS TO MAINTAIN MINIMUM CLEARANCE TO MEMBRANE AS REQUIRED ON THE UPPER SIDE OF ALL EQUIPMENT CURBS, TYPICAL.

G. REFER TO DETAILS 12/A1.3 FOR TYPICAL PENETRATION DETAIL.

H. REFER TO DETAIL 6/A1.3 FOR TYPICAL EQUIPMENT CURB DETAIL.

I. ALL ROOF SLOPES ARE 1/4"/FT. MIN.

X ROOF KEY NOTES

1. PRE-FIN. 6" X 6" S.M. GUTTER. REFER TO DTL. 3/A1.3.
2. PRE-FIN. 5" SQUARE S.M. DOWNSPOUT, INTO BOOT.
3. PRE-FIN. S.M. COPING. REFER TO DTL. 2/A1.3.
4. ROOFTOP EQUIPMENT. REFER TO DETAIL MECHANICAL.
5. PRE-FIN. ALUM. CANOPY W/ OVERHEAD STRUTS. REFER TO DETAIL 4/A1.5. TRANSITION CANOPY DS INTO ADJACENT BUILDING DS.
6. EXISTING COPING TO REMAIN. PROTECT AT ALL TIMES DURING CONSTRUCTION.
7. EXISTING GUTTER, PROTECT.
8. CONTINUOUS SHEET METAL EXPANSION JOINT.
9. REPLACE EXISTING METAL COPING TO NEAREST JOINT. MATCH DIM AND FINISH OF EXISTING.
10. PERIMETER OF CHIMNEY BELOW. REFER TO DEMO PLAN.
11. DRYER EXHAUST VENT. REFER TO MECH. AND DETAIL 12/A1.3.
12. AT LOCATION OF CONDUCTOR HEAD AND DOWNSPOUT REMOVAL (SEE DEMO PLAN), PROVIDE NEW ROOF LEADER. REFER TO FLOOR PLAN AND MECHANICAL. INTEGRATE LEADER WITH WATERTIGHT FITTING TO EXISTING DISCHARGE PIPE.
13. REMOVE / REINSTALL EXISTING COPING AS REQUIRED FOR NEW SPRAY FOAM WALL FLASHING AT VERTICAL FACE OF EXISTING PARAPET (WHERE ROOF SLOPE IS MODIFIED).
14. ROOF LADDER, REFER TO DETAIL 13/A1.3.
15. REMOVE AND REPLACE EXISTING METAL COPING PERPENDICULAR TO NEW HIGH WALL. INTEGRATE NEW AND EXISTING COPINGS FOR WATERTIGHT JOINTS.
16. REMOVE AND REPLACE EXISTING METAL COPING PERPENDICULAR TO NEW HIGH WALL. PROVIDE 6" VERTICAL LEG OF NEW COPING WITH END DAMS. INTEGRATE NEW AND EXISTING COPINGS FOR WATERTIGHT JOINTS.
17. FEATHER NEW SPRAY FOAM ROOFING INTO EXISTING FOR A CONSTANT SLOPE.
18. RETURN P.T. 2x8 TO EXISTING PERPENDICULAR WALL. PROVIDE SHEET METAL FLASHING AND COUNTERFLASHING FOR WATERTIGHT JOINTS.

ROOF LEGEND

ROOF ASSEMBLY - TYPE 'A'
SILICONE COATED 1-1/2" POLYURETHANE FOAM ROOF SYSTEM OVER 5/8" RECOVERY BOARD ON RIGID INSULATION ON STEEL DECK. INSULATION ASSEMBLY MINIMUM R-VALUE = 30. SLOPE AS INDICATED ON ROOF PLAN.

ROOF ASSEMBLY - TYPE 'B'
SILICONE COATED 1-1/2" POLYURETHANE FOAM ROOF SYSTEM OVER EXISTING FOAM ROOF SYSTEM. SCARIFY / PREP / CLEAN / SUPPLEMENT EXISTING ROOF SURFACES TO ACCEPT NEW POLYURETHANE FOAM ROOF SYSTEM PER MANUFACTURER'S WRITTEN RECOMMENDATION. SLOPE AS INDICATED ON ROOF PLAN.

EXISTING ROOF TO REMAIN, PROTECT

CRICKET
FORMED FROM POLYURETHANE FOAM ROOF SYSTEM.
SLOPE AS INDICATED ON ROOF PLAN.

2' WIDE ROOFTOP WALKWAY PAD. REFER TO SPECIFICATIONS.

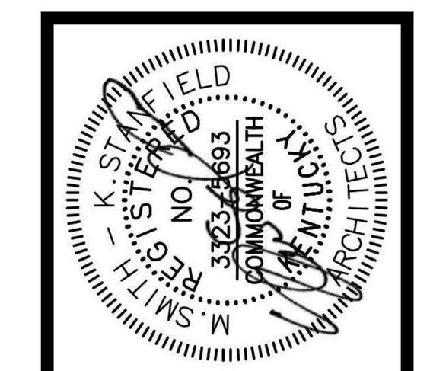
DS — 5"x5" S.M. DOWNSPOUT

RD/OD — ROOF DRAIN WITH INTERNAL OVERFLOW DRAIN

VTR — VENT THRU ROOF, REFER TO DETAIL 12/A1.3

GEJ — GUTTER EXPANSION JOINT PER SMACNA STANDARDS

SHERMAN CARTER BARNHART ARCHITECTS



LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

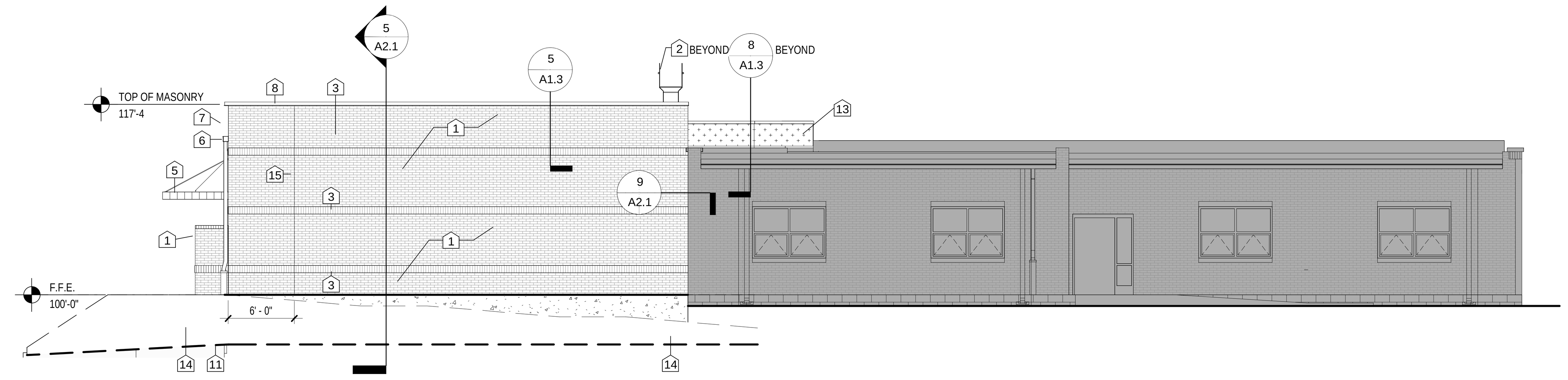
ROOF PLAN AND DETAILS

JOB NO.	2210
DATE	08 / 03 / 23
DRAWN	FMS
CHECKED	TSS

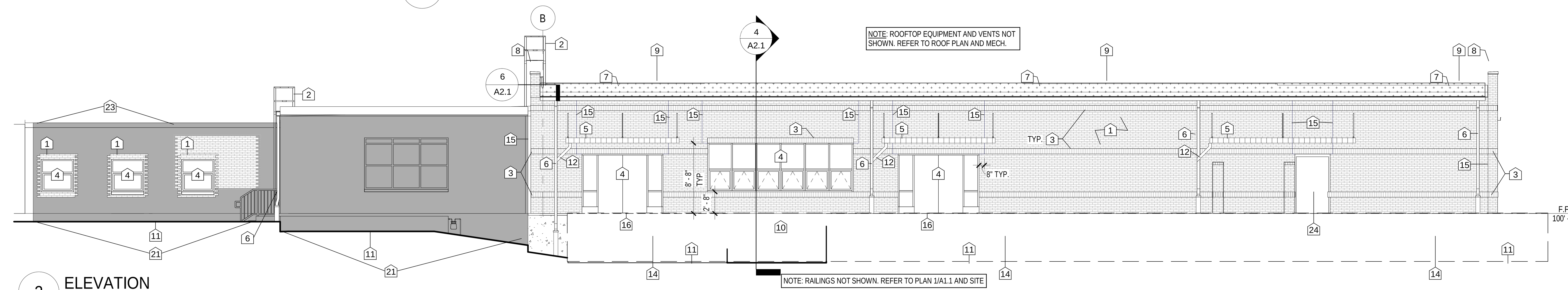
REVISIONS

No.	Description	Date

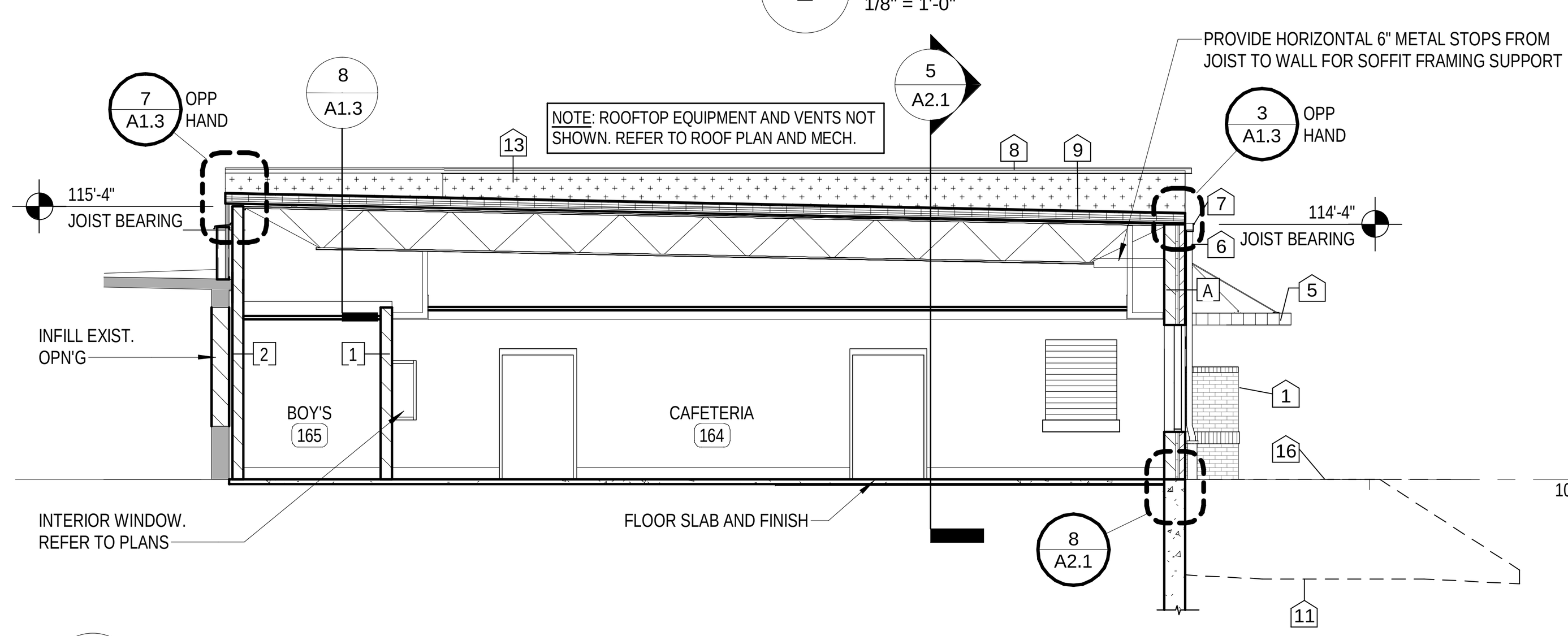
SHEET
A1.3



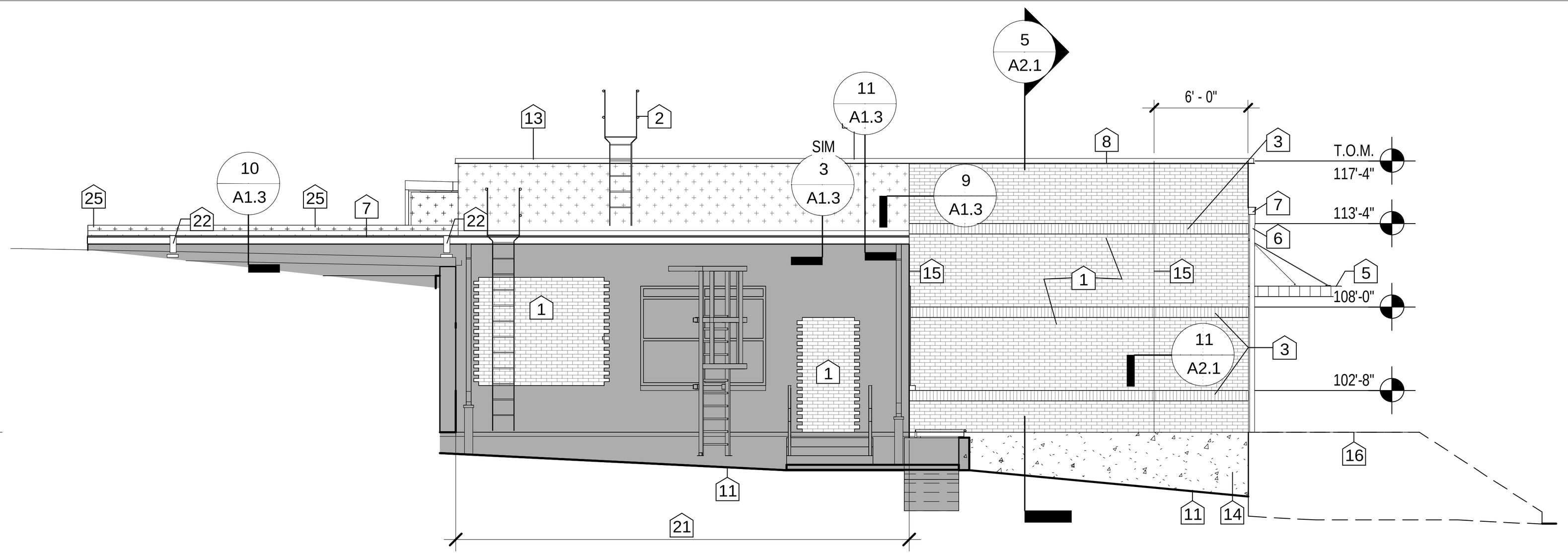
1 ELEVATION
1/8" = 1'-0"
NOTE: RAILINGS NOT SHOWN. REFER TO PLAN 1/A1.1 AND SITE



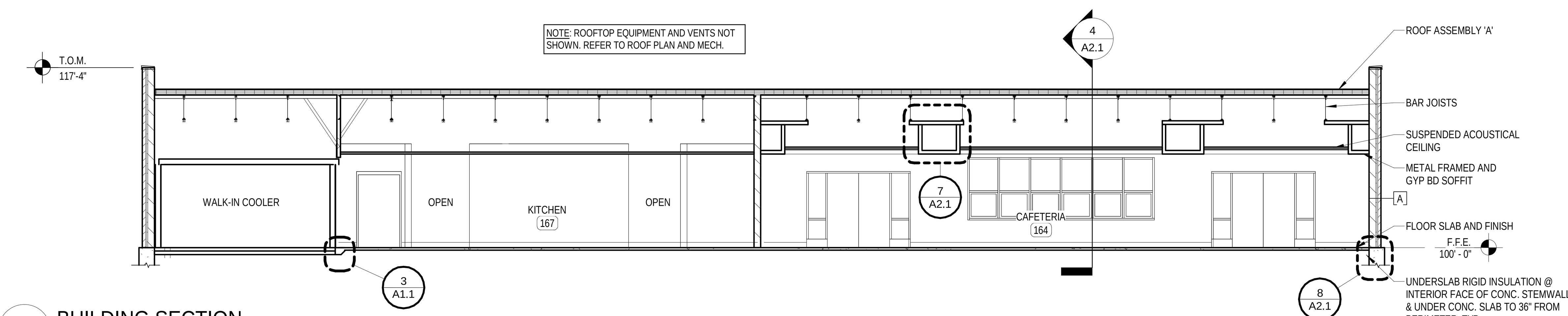
2 ELEVATION
1/8" = 1'-0"



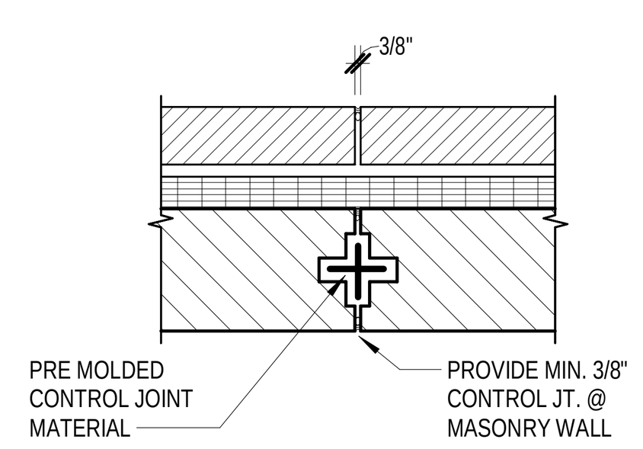
4 BUILDING SECTION
1/8" = 1'-0"
NOTE: RAILINGS NOT SHOWN. REFER TO PLAN 1/A1.1 AND SITE



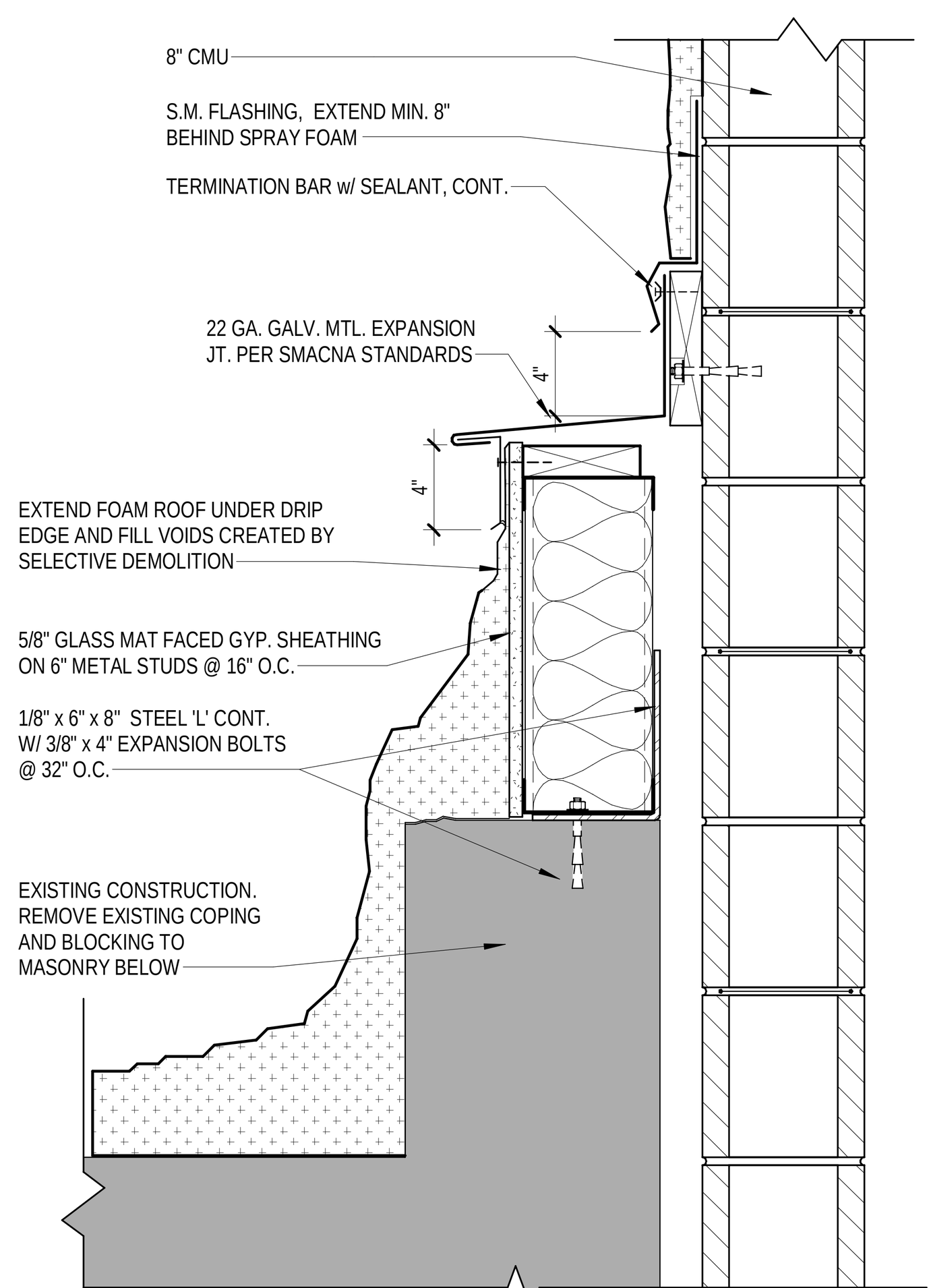
3 ELEVATION
1/8" = 1'-0"



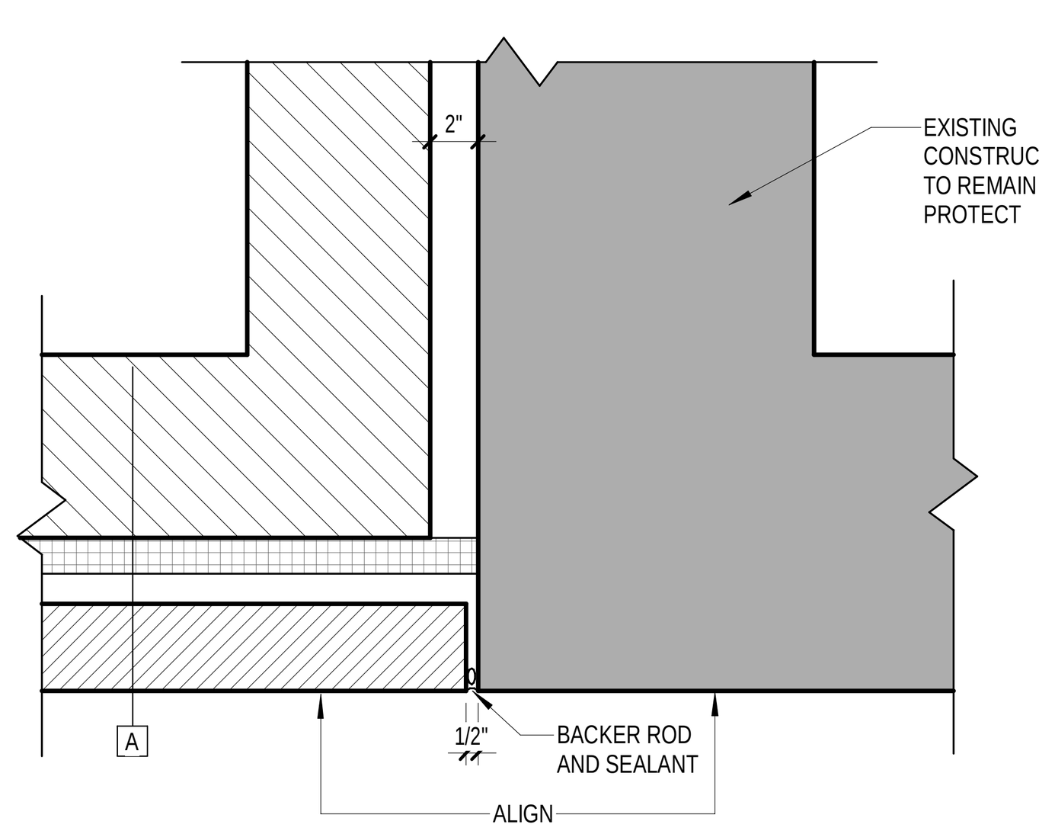
5 BUILDING SECTION
1/8" = 1'-0"



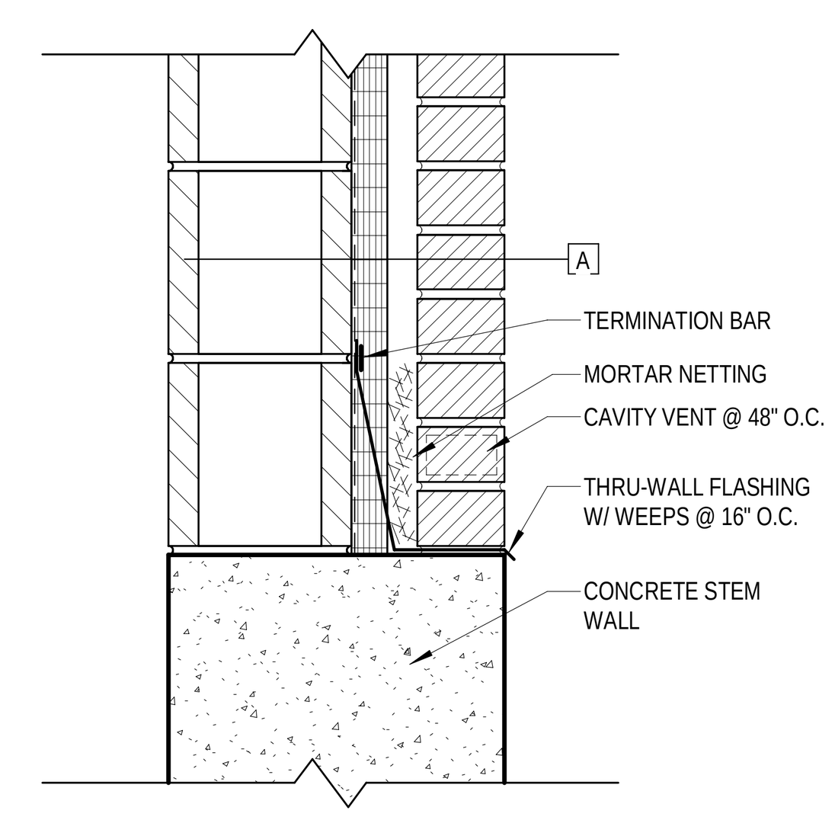
11 TYP. CONTROL/MASONRY EXPANSION JOINT (EXTERIOR)
1" = 1'-0"



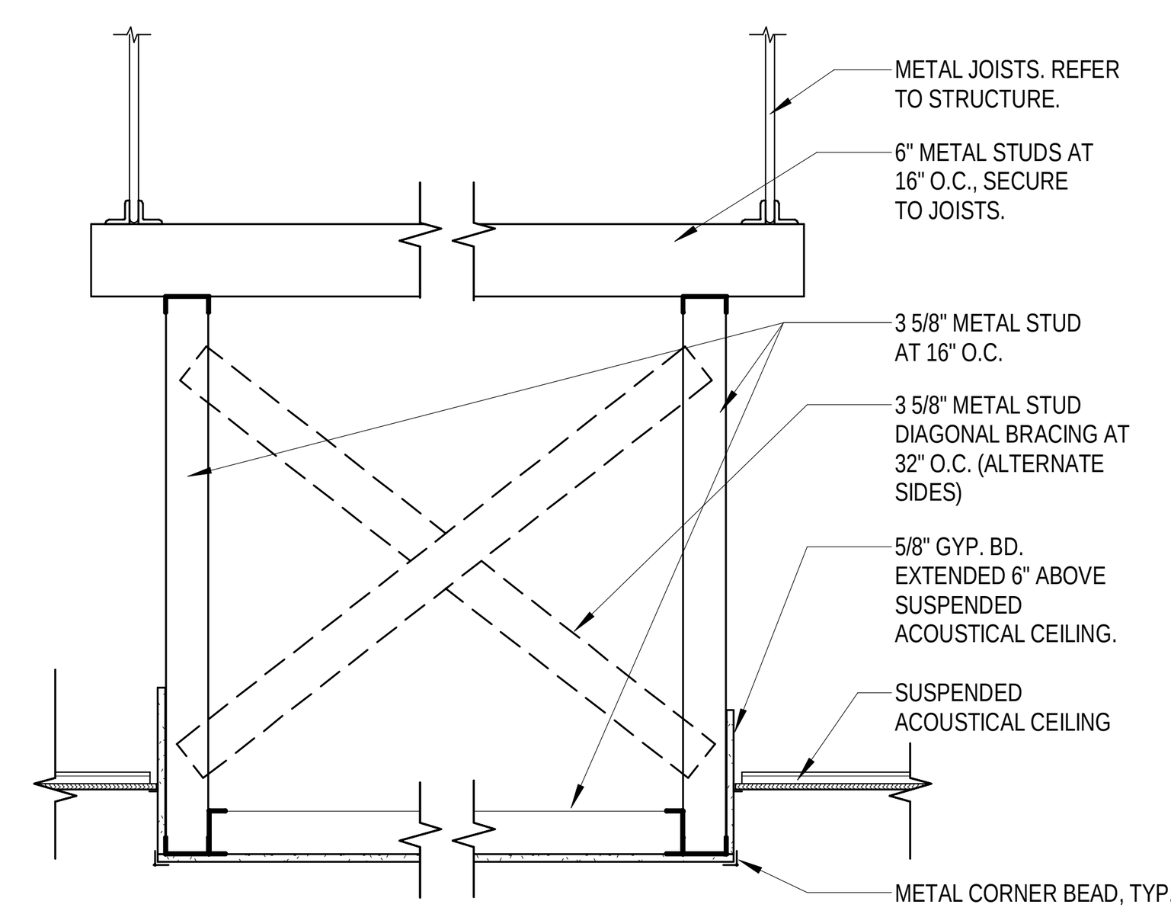
10 DETAIL
1 1/2" = 1'-0"



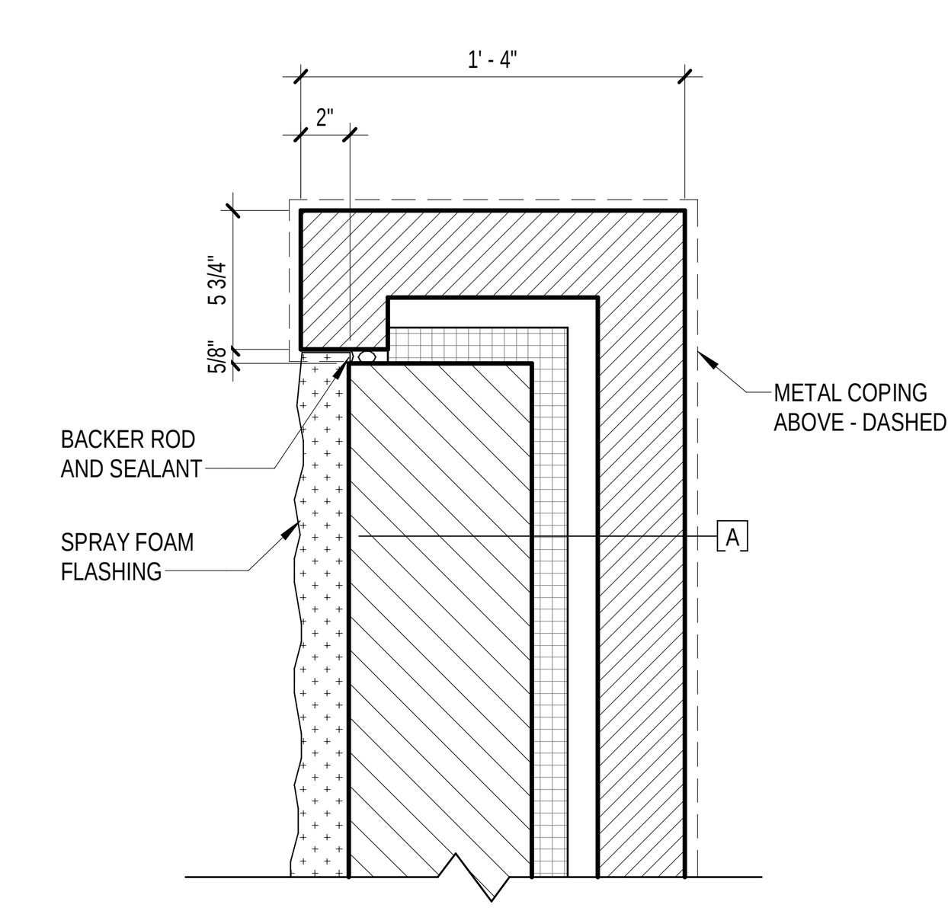
9 DETAIL
1 1/2" = 1'-0"



8 DETAIL
1 1/2" = 1'-0"



7 DETAIL
3/4" = 1'-0"



6 DETAIL
1 1/2" = 1'-0"

GENERAL ELEVATION NOTES

BUILDING ELEVATIONS SHOWN ON THIS DRAWING ARE INTENDED FOR GENERAL REFERENCE PURPOSES ONLY. REFER TO REFERENCED SECTIONS AND DETAILS FOR MORE FULLY DESCRIBED CONDITIONS AND REQUIREMENTS.

INDICATES EXISTING TO REMAIN

A. MATERIALS INDICATIONS AND DESCRIPTIONS, VERTICAL AND OTHER DIMENSIONS SHOWN ON ONE BUILDING ELEVATION APPLY TO OTHER BUILDING ELEVATIONS WHERE SHOWN UNLESS NOTED OTHERWISE.

B. LINES REPRESENTING PAVING AND FINISH GRADES ARE APPROXIMATE AND ARE SHOWN FOR REFERENCE PURPOSES ONLY. REFER TO SITE PLANS FOR SPECIFIC GRADE AND SPOT ELEVATIONS AT EACH RESPECTIVELY.

C. REFER TO FLOOR PLANS FOR LOCATION AND DOOR SCHEDULE FOR FULL EXTENT AND COMPLETE DESCRIPTION OF DOOR AND FRAME TYPES. PORTIONS OF WALLS, DOORS, AND HANDRAILS MAY BE CONCEALED BY OTHER BUILDING FEATURES SHOWN.

D. REFER TO FLOOR PLANS FOR SPECIFIC ALUMINUM STOREFRONT TYPES AND WINDOW ELEVATIONS.

E. LOCATIONS OF CONTROL/EXPANSION JOINTS IN MASONRY WALLS ARE SHOWN ON THIS DRAWING. SEE TYPICAL DETAILS ON SHEET A6.1 FOR SPECIFIC REQUIREMENTS AT RESPECTIVE LOCATIONS.

F. ALL EXPOSED NEW EXTERIOR MASONRY SHALL RECEIVE APPLICATION OF SPECIFIED WATER REPELLENT.

X ELEVATION KEY NOTES

NOTE: NOT ALL NOTES APPLY TO THIS SHEET.

1. FACE BRICK, IN RUNNING BOND PATTERN. ALIGN WITH ADJACENT EXISTING BRICK WHERE APPLICABLE.
2. LADDER TO ROOF, REFER TO ROOF PLAN.
3. SOLDIER COURSE BRICK BAND FLUSH & ADJACENT, PROVIDE SOLID UNITS AT CORNERS.
4. ALUMINUM FRAME STOREFRONT SYSTEM, REFER TO SHEET A4.1.
5. MANUFACTURED CANOPY, REFER TO ROOF PLAN.
6. DOWNSPOUT, EXTEND TO BOOT. REFER TO ROOF PLAN AND SITE DEVELOPMENT DRAWINGS.
7. GUTTER, REFER TO ROOF PLAN.
8. COPING. REFER TO ROOF DETAILS.
9. ROOF ASSEMBLY TYPE "A".
10. CONCRETE STEPS. REFER TO SITE.
11. FINISH GRADE VARIES, REFER TO SITE DRAWINGS.
12. CANOPY DOWNSPOUT DISCHARGE INTO ADJACENT BUILDING DOWNSPOUT.
13. SPRAY FOAM ROOFING APPLIED TO VERTICAL WALL.
14. CONCRETE STEM WALL FOR PLATFORM / RAMP, REFER TO SITE.
15. MASONRY EXPANSION JOINTS. FULL HEIGHT, REFER TO DETAIL 11/A2.1.
16. CONCRETE PLATFORM / RAMP EDGE. REFER TO SITE.
17. ROOF EXPANSION BELLOWS. CONT.
18. MODIFY EXISTING ROOF SLOPE WITH NEW SPRAY FOAM ROOFING OVER PREPARED SURFACE OF EXISTING SPRAY FOAM ROOFING. REFER TO ROOF PLAN.
19. RAMP BEYOND. REFER TO SITE.
20. APPROXIMATE ROOF DRAIN LOCATION. REFER TO ROOF PLAN.
21. APPLY WATER REPELLANT SEALER AT ALL NOTED EXTERIOR BRICK. WHERE EXISTING OPENINGS RECEIVE NEW BRICK, CLEAN EXISTING MASONRY FULL LENGTH OF WALL FROM / TO NEAREST CORNER AND APPLY REPELLANT TO EXISTING BRICK ALSO.
22. DOWNSPOUT. DISCHARGE TO SPLASHBLOCK ON ROOF.
23. FILL ALL HOLES IN EXISTING EXTERIOR BRICK WALL AND CONCRETE STEMWALL RESULTANT FROM DEMOLITION OF STRUCTURE CONTAINING COOLER/FREEZER/ CORRIDOR WITH CUSTOM COLOR SEALANT & MATCH EXISTING. BROADCAST SAND IN INSTALLED SEALANT.
24. H.M. DOOR AND FRAME. PAINT.
25. SHEET METAL FASCIA. SEE DETAIL 10/A1.3.
26. VERTICAL 2X2" SHEET METAL.

SHERMAN CARTER BARNHART ARCHITECTS

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

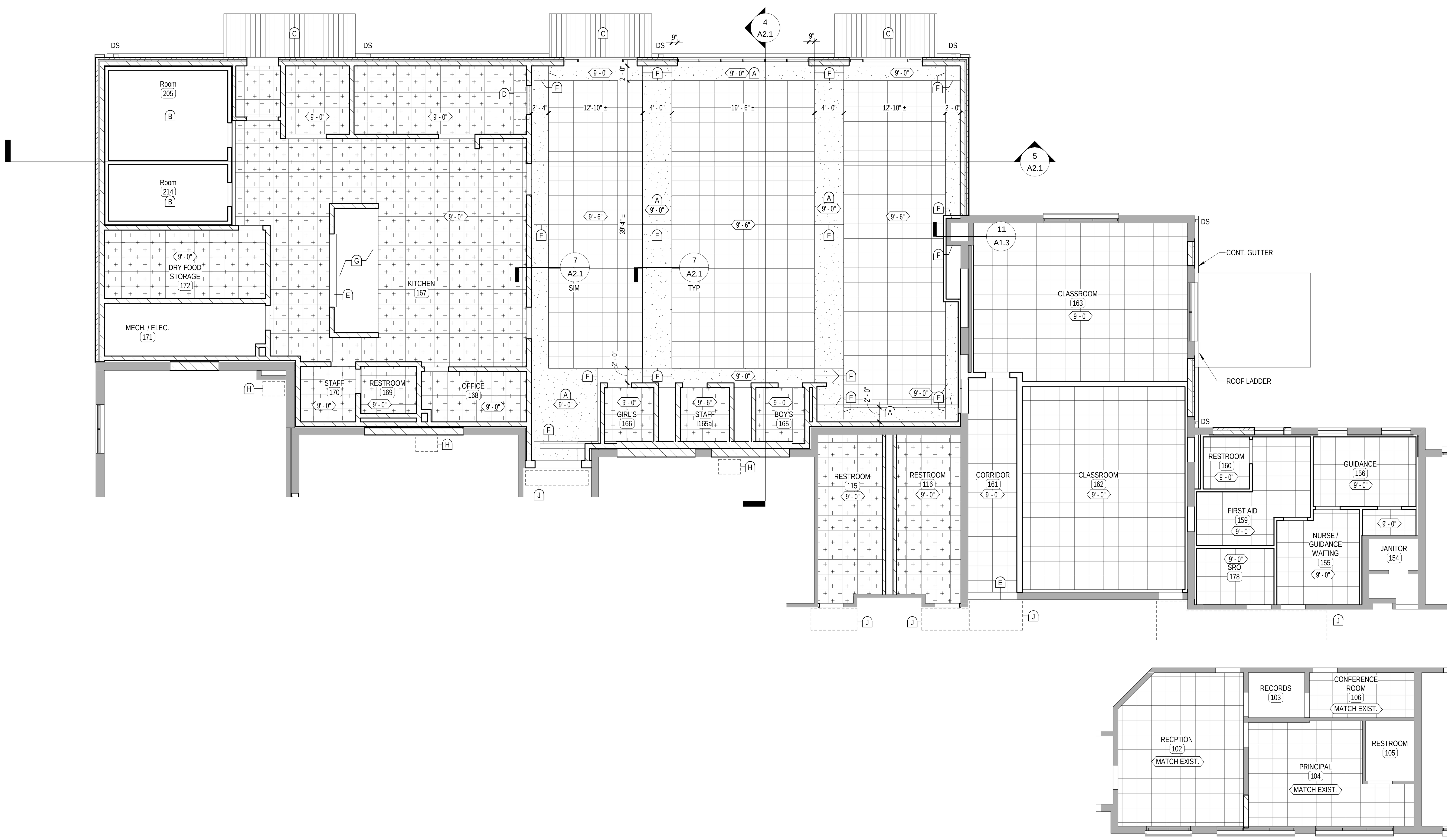
BUILDING ELEVATIONS & SECTIONS

JOB NO.	2210
DATE	08 / 03 / 23
DRAWN	FMS
CHECKED	TSS

REVISIONS

No.	Description	Date

SHEET
A2.1



1 REFLECTED CEILING PLAN
1/8" = 1'-0"

REFLECTED CEILING PLAN KEY NOTES

NOTE: NOT ALL NOTES APPLY TO THIS SHEET.

A. GYP BD SOFFIT. PRIME AND PAINT.
B. CEILING OF WALK-IN COOLER/FREEZER OPEN TO STRUCTURE ABOVE.
C. CANOPY. REFER TO ROOF PLAN.
D. OVERHEAD COILING SHUTTER. REFER TO PLANS.
E. CMU BULKHEAD.
F. CONTROL JOINT.
G. KITCHEN RANGE HOOD. REFER TO MECH. DWGS.
H. REMOVE AND REPLACE EXISTING ACOUSTICAL CEILING TILE AND SUSPENSION SYSTEM FOR PLACEMENT OF NEW ROOF DRAINS / LEADERS.
J. REMOVE AND REPLACE EXISTING ACOUSTICAL CEILING TILE AND SUSPENSION SYSTEM AS REQ'D TO FACILITATE NEW MASONRY OPENINGS.

REFLECTED CEILING LEGEND

TYPE A 2'x2' SUSPENDED ACOUSTICAL CEILING.

TYPE B 2'x2' VINYL FACED SUSPENDED ACOUSTICAL CEILING.

GYP. BD. PRIME AND PAINT.

OPEN TO STRUCTURE ABOVE

GENERAL CEILING NOTES

1. REFER TO MECHANICAL AND/OR ELECTRICAL DRAWINGS FOR TYPE, SIZE AND OTHER REQUIREMENTS PERTAINING SPECIFICALLY TO THE REFLECTED CEILING PLANS.
2. REFER TO WALL PARTITION TYPES FOR DESCRIPTION OF WALLS EXTENDING (OR NOT) TO UNDERSIDE OF DECKING AND/OR STRUCTURE ABOVE.
3. INSTALL SPRINKLER HEADS IN THE CENTER OF CEILING PANELS.
4. CONTRACTOR TO SUBMIT FULL COORDINATION DRAWINGS FOR ALL CEILING ITEMS INCLUDING JOIST SPACING /LIGHTING, HVAC LAYOUT AND FIRE PROTECTION SYSTEMS.

SHERMAN CARTER BARNHART ARCHITECTS

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

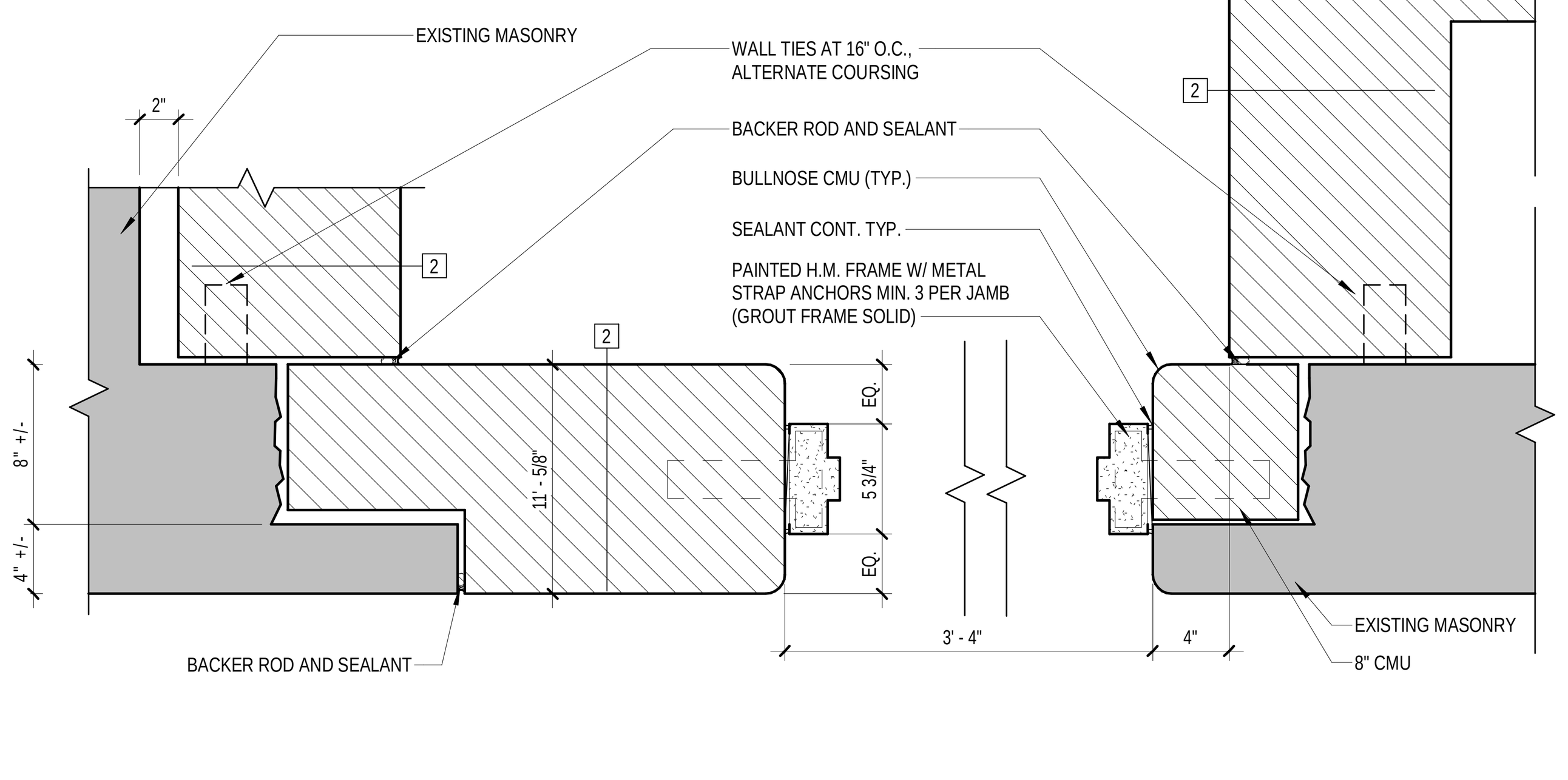
REFLECTED CEILING PLANS AND DETAILLS

JOB NO.	2210
DATE	08 / 03 / 23
DRAWN	TM, KL
CHECKED	TSS

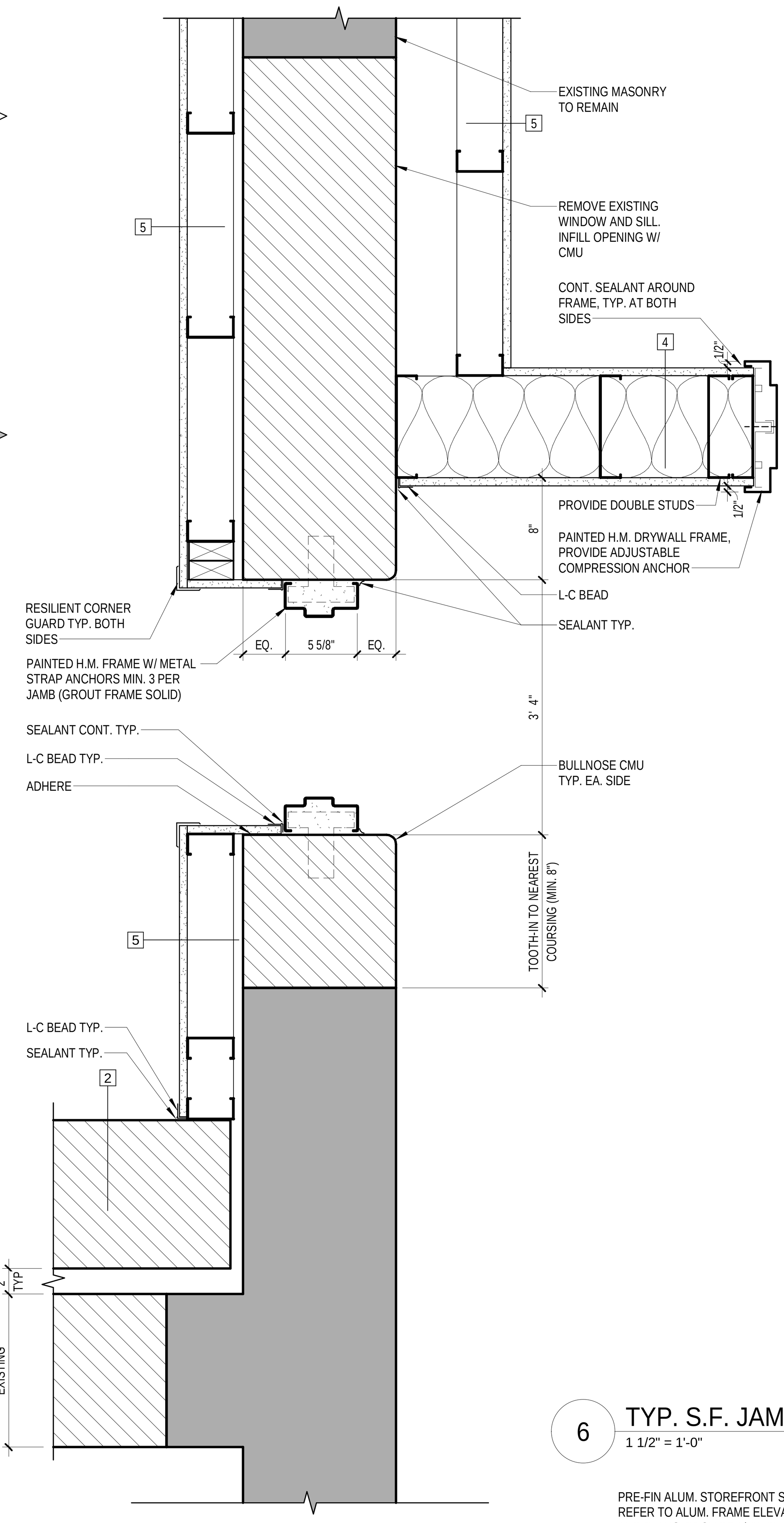
REVISIONS

No.	Description	Date

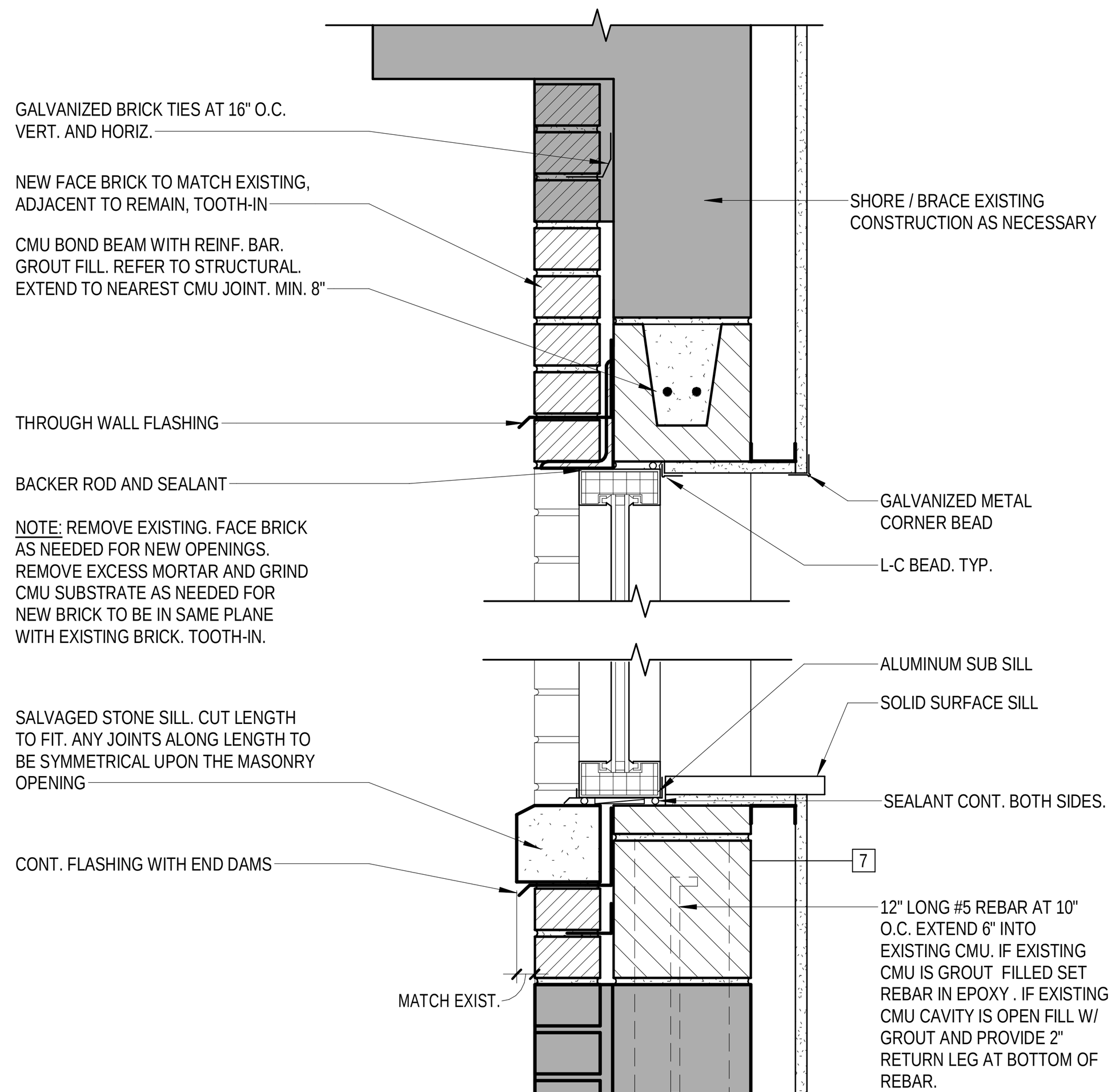
SHEET
A3.1



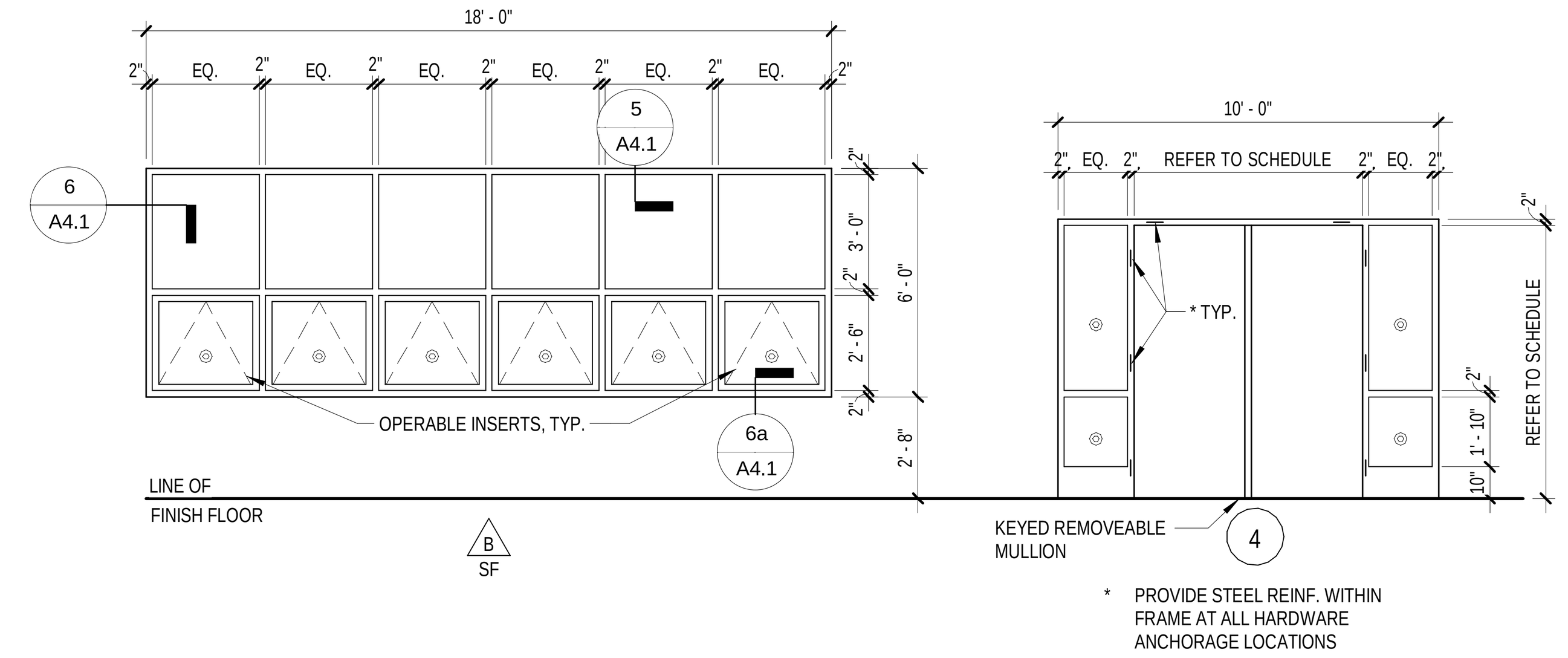
11 JAMB DETAIL
1 1/2" = 1'-0"
NOTE: TOOTH-IN NEW MASONRY INTO EXISTING



8 JAMB DETAIL
1 1/2" = 1'-0"



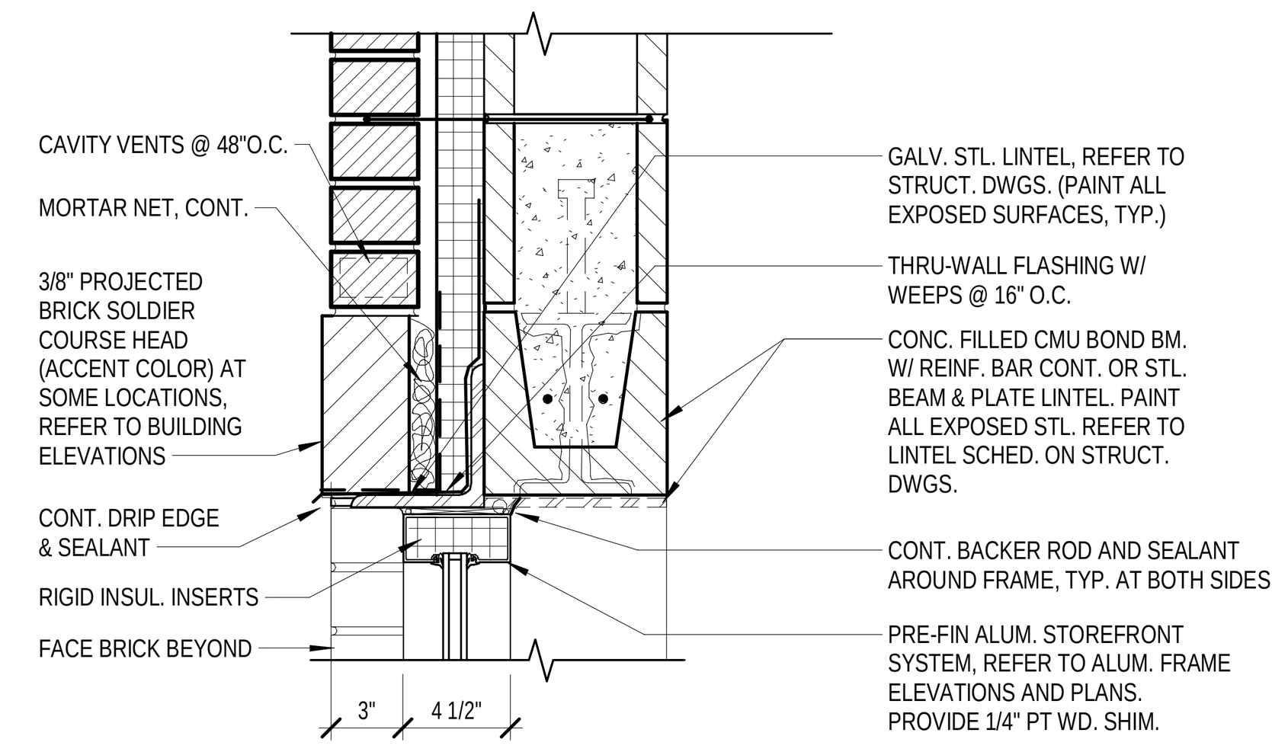
12 STOREFRONT DETAIL
1 1/2" = 1'-0"



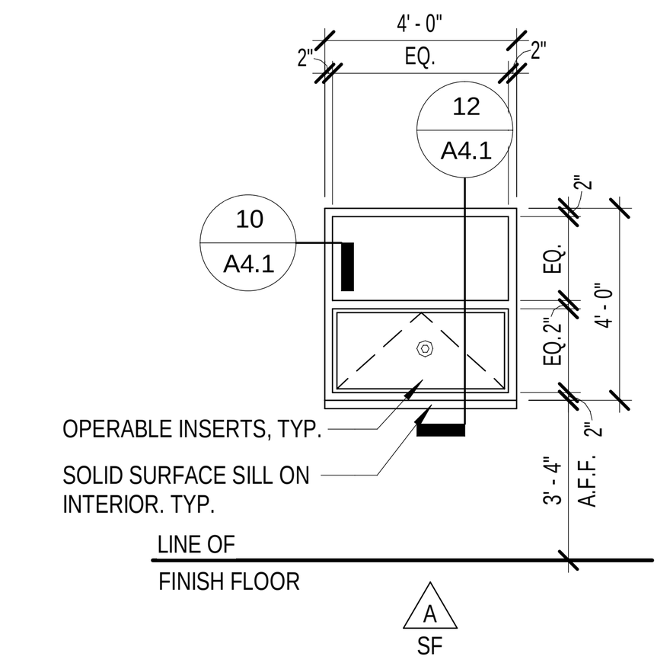
ALUMINUM FRAME TYPES

1/4" = 1'-0" ALL EXTERIOR GLAZING SHALL BE 1" INSULATED.
DENOTES TEMPERED GLASS

NOTE: APPLY VINYL LETTERS OR NUMBERS TO INTERIOR FACE OF GLASS AT NEW EXTERIOR FRAMES. REFER TO SIGN DETAILS, SHEET A0.0.

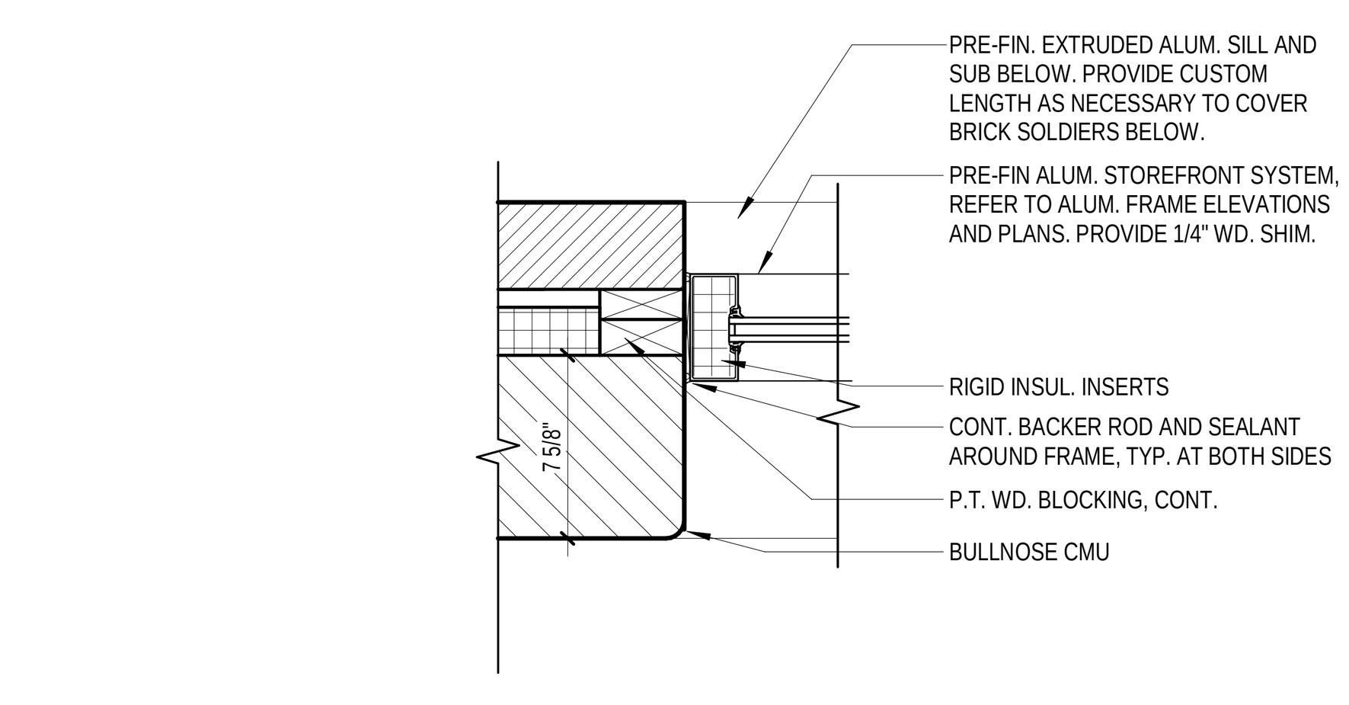


5 S.F. HEAD @ CMU / BRICK
1 1/2" = 1'-0"

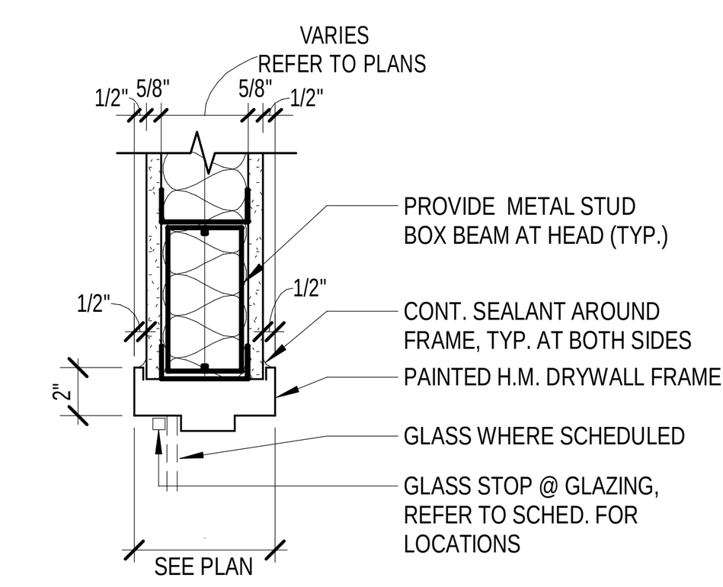


ALUMINUM STOREFRONT TYPES

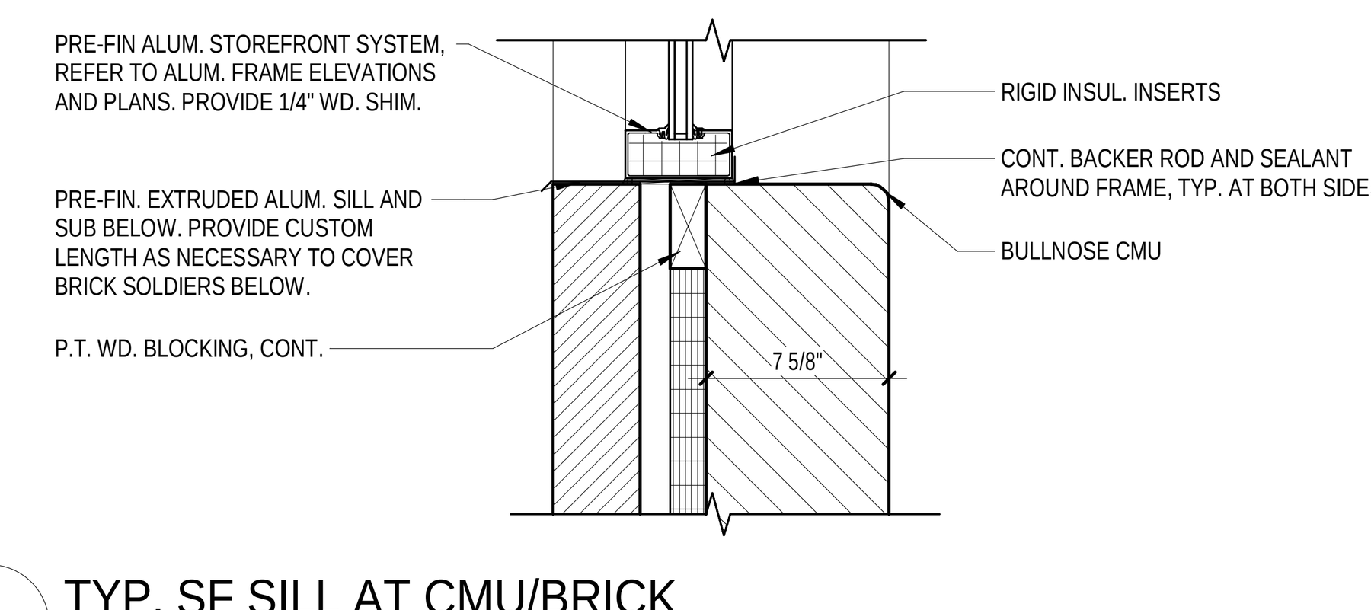
1/4" = 1'-0" ALL EXTERIOR GLAZING SHALL BE 1" INSULATED.
DENOTES TEMPERED GLASS



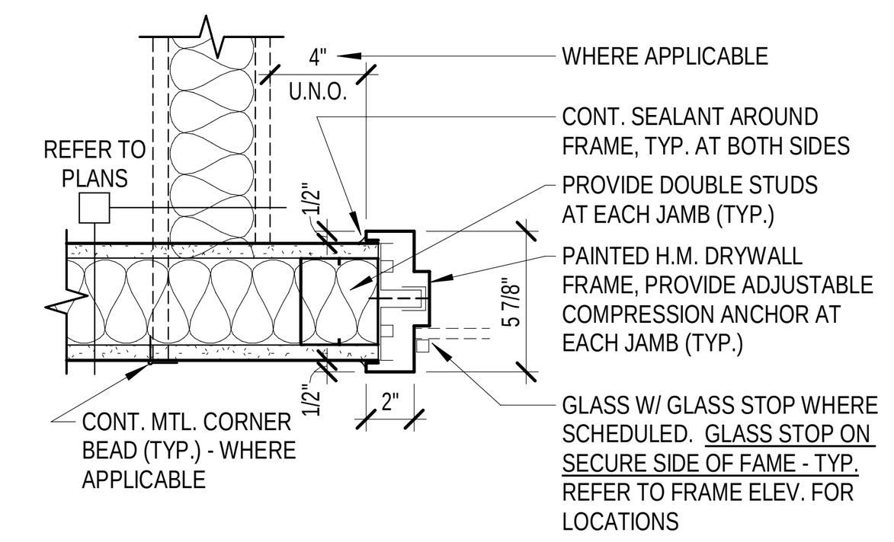
6 TYP. S.F. JAMB @ CMU / BRICK
1 1/2" = 1'-0"



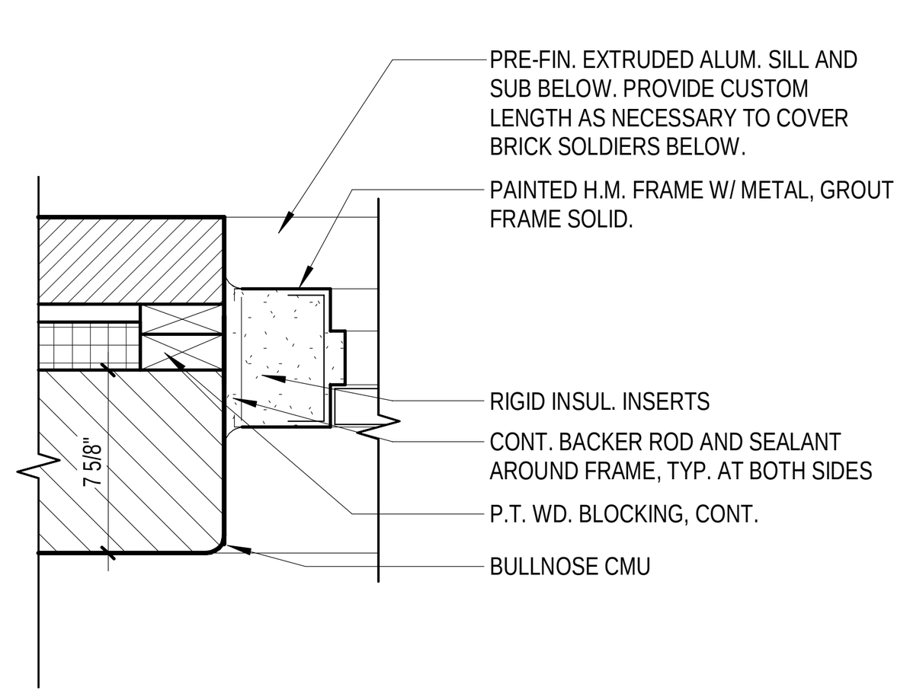
1 TYP. H.M. HEAD @ MTL. STUD
1 1/2" = 1'-0"



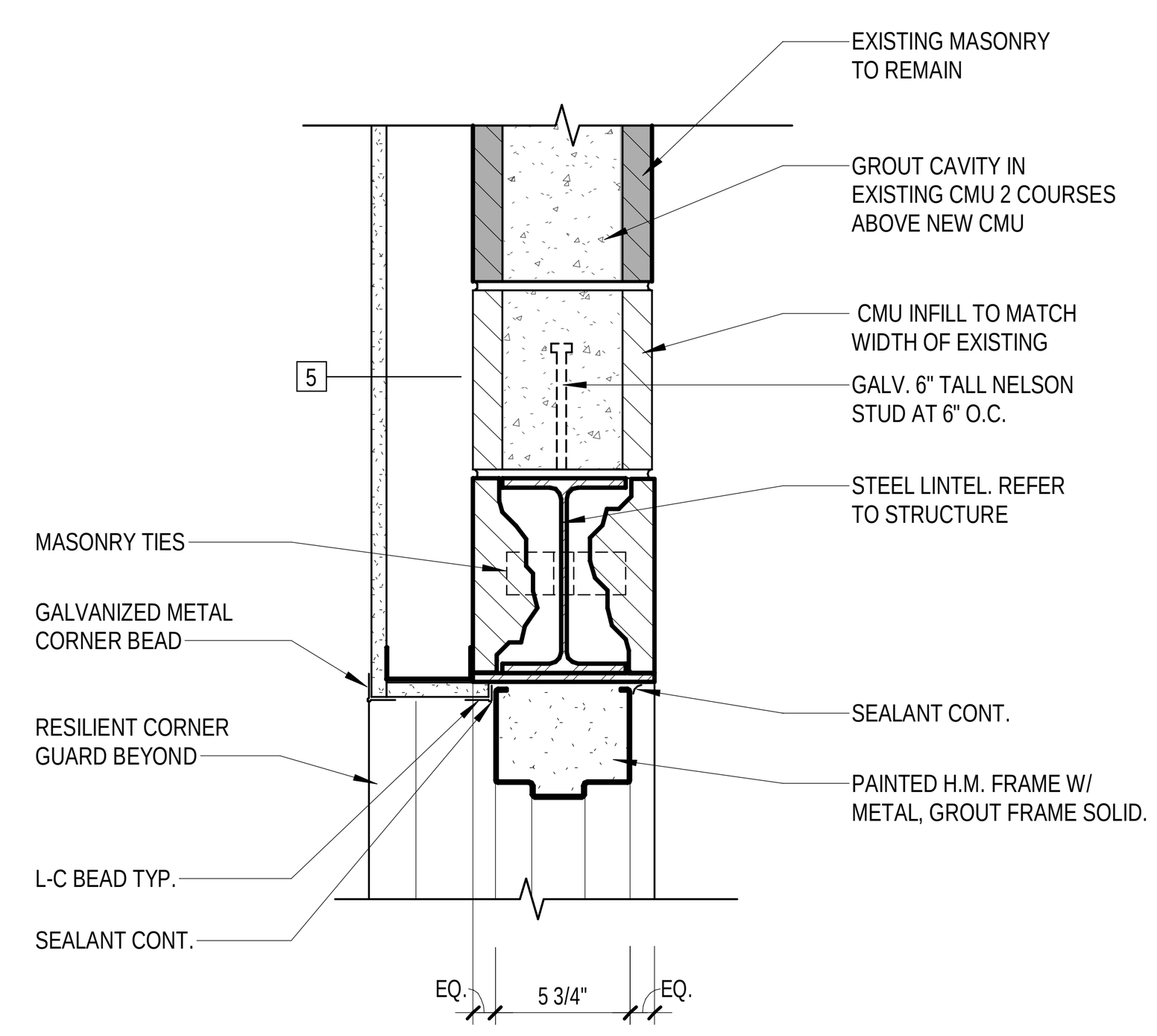
6a TYP. SF SILL AT CMU/BRICK
1 1/2" = 1'-0"



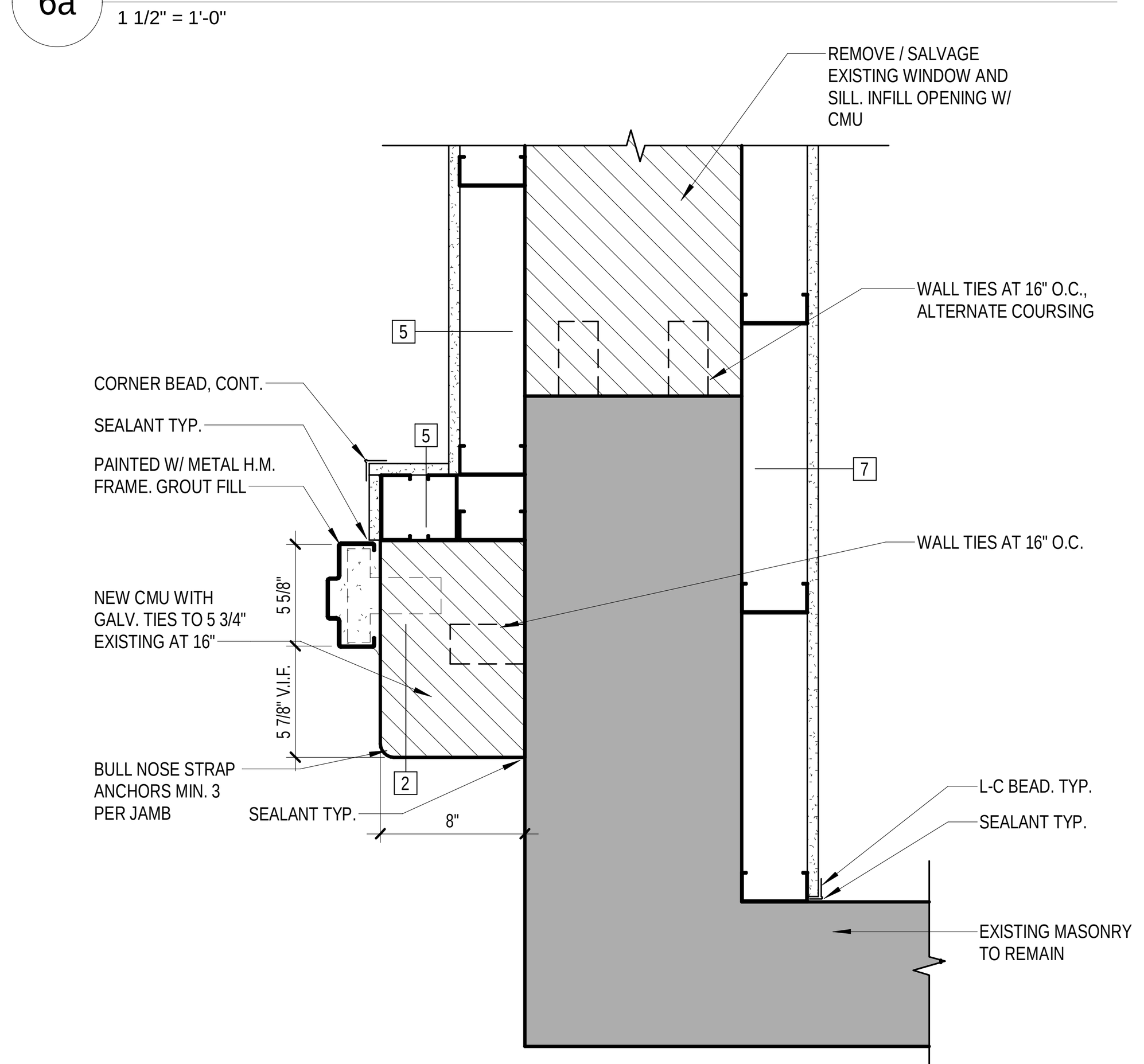
2 TYP. H.M. HEAD @ CMU
1 1/2" = 1'-0"



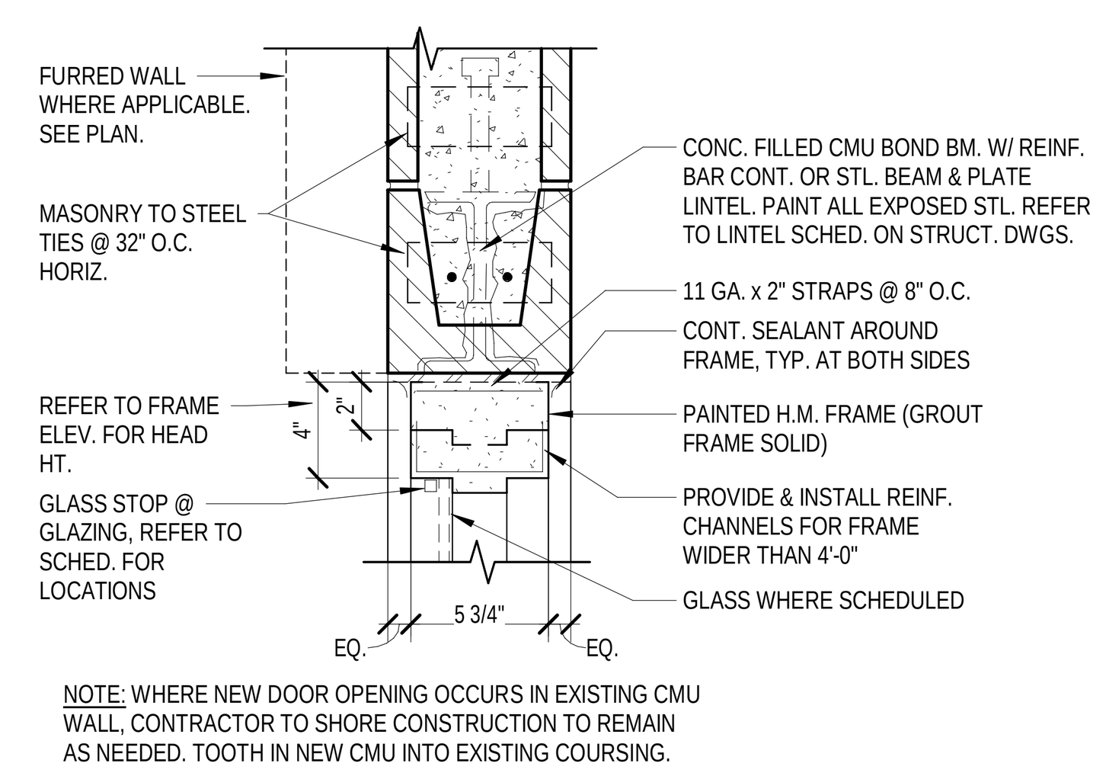
14 TYP. S.F. JAMB @ CMU / BRICK
1 1/2" = 1'-0"



9 HEAD DETAIL
1 1/2" = 1'-0"

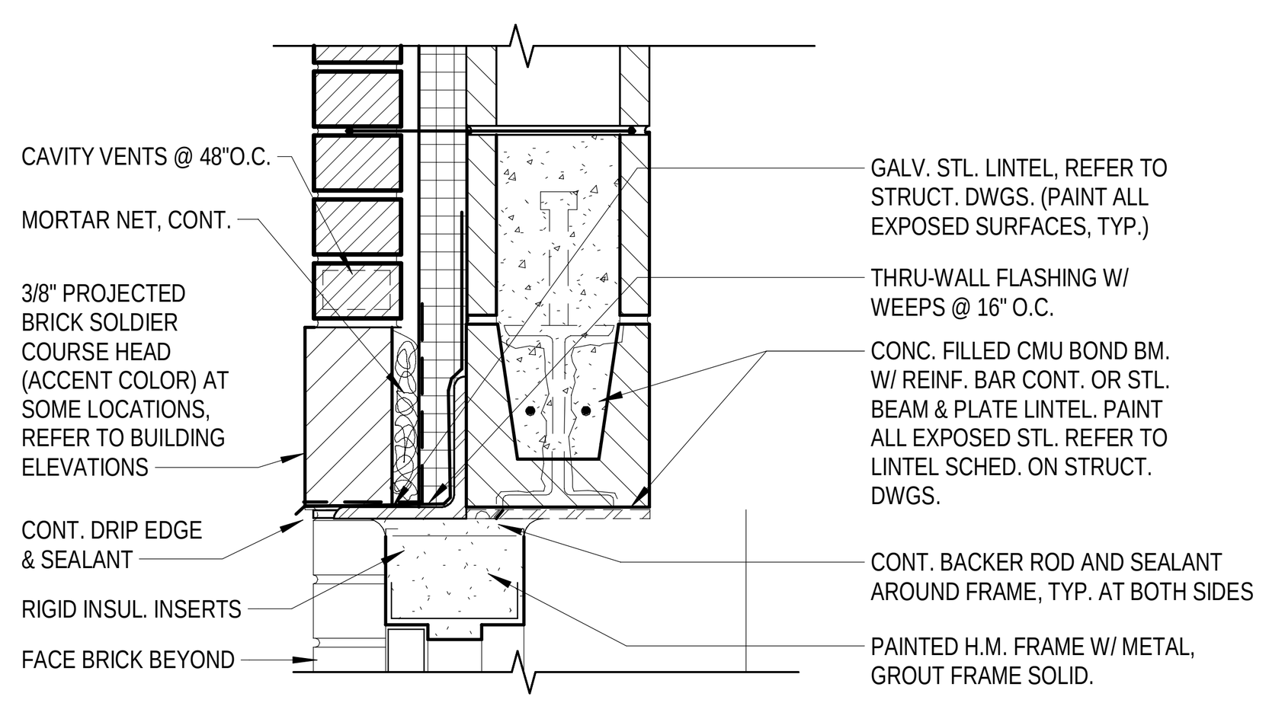


7 JAMB DETAIL
1 1/2" = 1'-0"

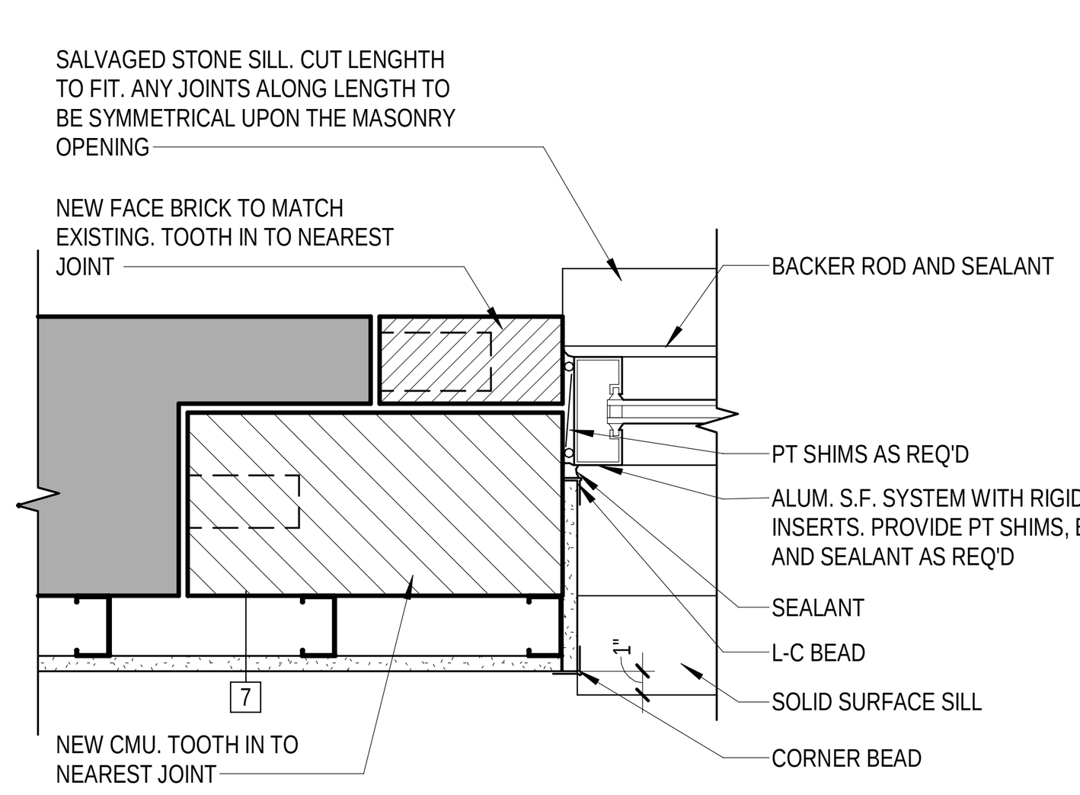


NOTE: WHERE NEW DOOR OPENING OCCURS IN EXISTING CMU WALL, CONTRACTOR TO SHORE CONSTRUCTION TO REMAIN AS NEEDED. TOOTH IN NEW CMU INTO EXISTING COURSING.

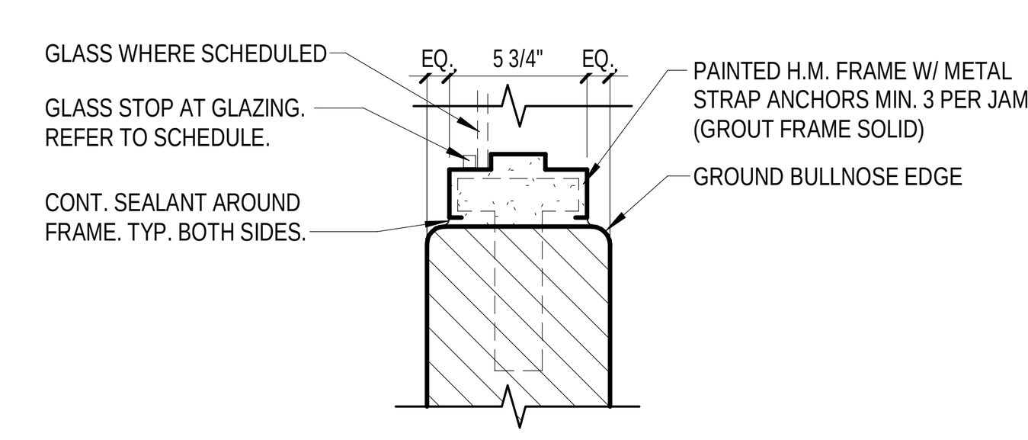
3 TYP. H.M. HEAD @ CMU
1 1/2" = 1'-0"



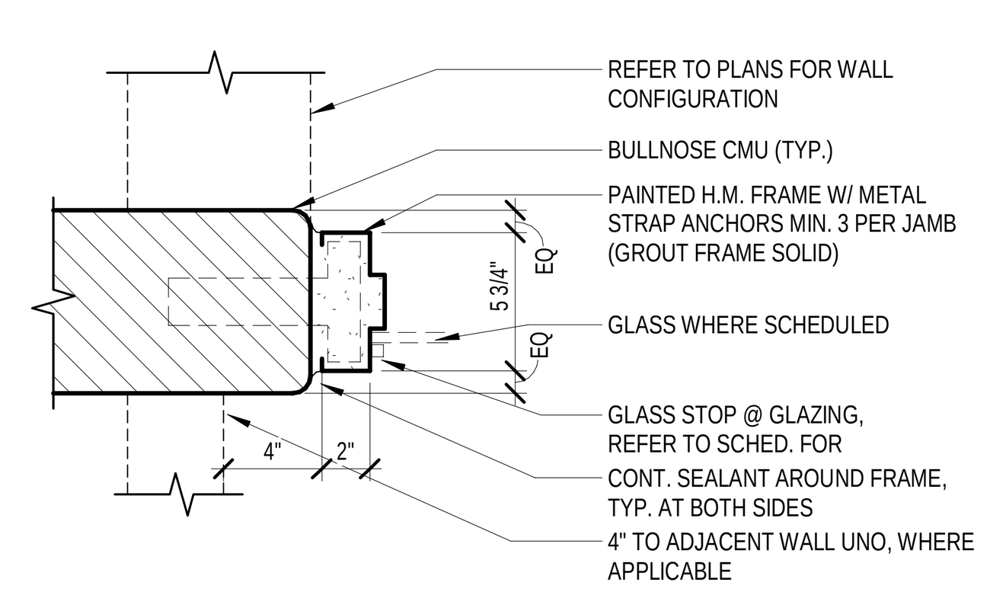
13 S.F. HEAD @ CMU / BRICK
1 1/2" = 1'-0"



10 JAMB DETAIL
1 1/2" = 1'-0"



4a SILL DETAIL
1 1/2" = 1'-0"



4 TYP. H.M. JAMB @ CMU
1 1/2" = 1'-0"

DOOR SCHEDULE

NO.	DOOR: NO. LEAVES	DOOR: LEAF WIDTH	DOOR: HT.	DOOR: MATL.	DOOR: TYPE	DOOR: GLAZING	FRAME: MATL.	FRAME: TYPE	FRAME: GLAZING	FRAME: HEAD	FRAME: JAMB	DOOR FIRE RATING	CLOSER DEG.	REMARKS
102b	1	3' - 0"	7' - 0"	EX.	EX.	EX.	EX.	EX.	EX.	EX.	EX.	EX.	EX.	18
102c	1	3' - 0"	7' - 0"	EX.	EX.	EX.	EX.	EX.	EX.	EX.	EX.	EX.	EX.	18
104	1	3' - 0"	7' - 0"	SCWD.	N	1/4"	EXIST.	2	-	-	-	-	-	10, 14
115	1	3' - 0"	7' - 0"	SCWD.	F	-	H.M.	1	-	6/A1.2	6/A1.2	-	90	10, 13
116	1	3' - 0"	7' - 0"	SCWD.	F	-	H.M.	1	-	6/A1.2	6/A1.2	-	90	10, 13
155	1	3' - 0"	7' - 0"	SCWD.	N	1/4"	H.M.	1	-	3/A4.1	4/A4.1	-	90	10
156	1	3' - 0"	7' - 0"	SCWD.	F	-	H.M.	2	-	1/A4.1	2/A4.1	-	-	-
157	1	3' - 0"	7' - 0"	SCWD.	F	-	H.M.	2	-	1/A4.1	2/A4.1	-	-	-
159	1	3' - 0"	7' - 0"	SCWD.	HG	1/4"	H.M.	2	-	1/A4.1	2/A4.1	-	-	-
160	1	3' - 0"	7' - 0"	SCWD.	F	-	H.M.	2	-	1/A4.1	2/A4.1	-	-	-
162	1	3' - 0"	7' - 0"	SCWD.	N	1/4"	H.M.	1	-	3/A4.1	4/A4.1	-	-	10
163	1	3' - 0"	7' - 0"	SCWD.	N	1/4"	H.M.	2	-	1/A4.1	8/A4.1	-	-	10
164a	1	3' - 0"	7' - 0"	SCWD.	FG	1±" INSUL.	H.M.	1	-	-	9/A4.1	-	90	10
164b	2	3' - 0"	7' - 0"	SCWD.	FG	1±" INSUL.	H.M.	1	-	3/A4.1	10/A4.1	-	90	4, 10,16
165	1	3' - 0"	7' - 0"	SCWD.	F	-	H.M.	1	-	3/A4.1	4/A4.1	-	-	10, 11, 15
165a	1	3' - 0"	7' - 0"	SCWD.	F	-	H.M.	1	-	3/A4.1	4/A4.1	-	-	10, 11, 15
165b	1	2' - 0"	7' - 0"	SCWD.	F	-	H.M.	1	-	3/A4.1	4/A4.1	-	-	-
166	1	3' - 0"	7' - 0"	SCWD.	F	-	H.M.	1	-	3/A4.1	4/A4.1	-	-	10, 11, 15
166a	1	2' - 0"	7' - 0"	SCWD.	F	-	H.M.	1	-	3/A4.1	4/A4.1	-	-	-
167a	1	4' - 0"	4' - 6"	MFR.	CS	-	MFR.	-	-	6/A1.1	6/A1.1	-	-	7
167b	1	4' - 0"	7' - 0"	SCWD.	F	-	H.M.	1	-	3/A4.1	4/A4.1	-	175	10
167c	1	4' - 0"	7' - 0"	SCWD.	F	-	H.M.	1	-	3/A4.1	4/A4.1	-	175	10
167d	1	4' - 0"	7' - 0"	H.M.	N	1/4"	H.M.	1	-	3/A4.1	4/A4.1	-	90	5, 12
168	1	3' - 0"	7' - 0"	SCWD.	HG	1/4"	H.M.	1	-	3/A4.1	4/A4.1	-	-	10
169	1	3' - 0"	7' - 0"	SCWD.	F	-	H.M.	1	-	3/A4.1	4/A4.1	-	-	10, 11, 15
171	1	3' - 0"	7' - 0"	H.M.	F	-	H.M.	1	-	3/A4.1	4/A4.1	-	90	10
172	1	3' - 0"	7' - 0"	H.M.	F	-	H.M.	1	-	3/A4.1	4/A4.1	-	-	10
178	1	3' - 0"	7' - 0"	SCWD.	F	-	H.M.	1	-	3/A4.1	4/A4.1	-	90	10
E164a	2	3' - 0"	7' - 2"	ALUM.	FG	1" INSUL.	ALUM.	4	1" INSUL.	5/A4.1	6/A4.1	-	175	2, 3, 4, 5, 8, 16, 19
E164b	2	3' - 0"	7' - 2"	ALUM.	FG	1" INSUL.	ALUM.	4	1" INSUL.	5/A4.1	6/A4.1	-	175	2, 3, 4, 5, 8, 19
E167	1	4' - 0"	7' - 0"	GALV.	N	1" INSUL.	GALV.	1	-	13/A4.1	14/A4.1	-	90	1, 2, 3, 5, 16, 17
T1		3' - 0"	6' - 8"	-	REFER TO SPECIFICATIONS									
T2		2' - 4"	6' - 8"	-	REFER TO SPECIFICATIONS									

DOOR AND FRAME NOTES:

HOLLOW METAL FRAME NOTES:
1. PROVIDE REINFORCING 12 GA. CHANNEL IN FRAME HEAD AT ALL H.M. FRAMES WHERE TOTAL FRAME WIDTH IS GREATER THAN 4'-0".
2. PROVIDE 11 - GA x 2" WIDE STRAPS AT 8" O.C. IN H.M. FRAME HEADS GREATER THAN 2" IN HEIGHT, TYPICAL.
3. LINTEL BEAM LENGTH SHALL BE M.O. PLUS 16" LONG (MIN 8" BEARING AT EACH END UNLESS NOTED OTHERWISE). LINTEL PLATE LENGTH SHALL BE M.O. LESS 1/4" LONG (1/8" AT EACH END MAX.). REFER TO STRUCTURAL DRAWINGS FOR LINTEL INFORMATION.
4. WHERE GLAZING IS SHOWN, THE FRAME FABRICATOR SHALL PRE-DRILL STOPS AND FRAME TO RECEIVE MOUNTING SCREWS. VERIFY LOCATIONS AND DEPTH OF GLAZING MATERIAL,EQUAL SPACE SCREWS.
5. ALL EXTERIOR HOLLOW METAL FRAMES SHALL BE GALVANIZED, 14 GA.

DOOR NOTES:
1. UNDERCUT AT NON-RATED S.C. WOOD DOORS 1/2" FROM BOTTOM OF DOOR TO SCHEDULED FLOOR FINISH.
2. UNDERCUT AT EXTERIOR DOORS 1/8" MAX. FROM BOTTOM OF DOOR TO TOP OF THRESHOLD, WEATHER STRIP MUST CLOSE TIGHTLY AGAINST THRESHOLD.
3. ALL EXTERIOR HOLLOW METAL DOORS BE GALVANIZED AND HAVE FLUSH CLOSURE CAPS16 GA. WELD CONT. TOP AND BOTTOM.
4. PROVIDE THRESHOLDS AS REQUIRED AT DOORS. SEE THIS SHEET FOR TYPICAL THRESHOLD DETAILS AND FLOOR FINISHES.

GLASS AND GLAZING NOTES:
1. PROVIDE FULLY TEMPERED (FT) GLASS WHERE INDICATED ON SCHEDULE AND/OR SHOWN ON DOOR AND FRAME TYPES, OR AS REQ'D
2. BY CODE.

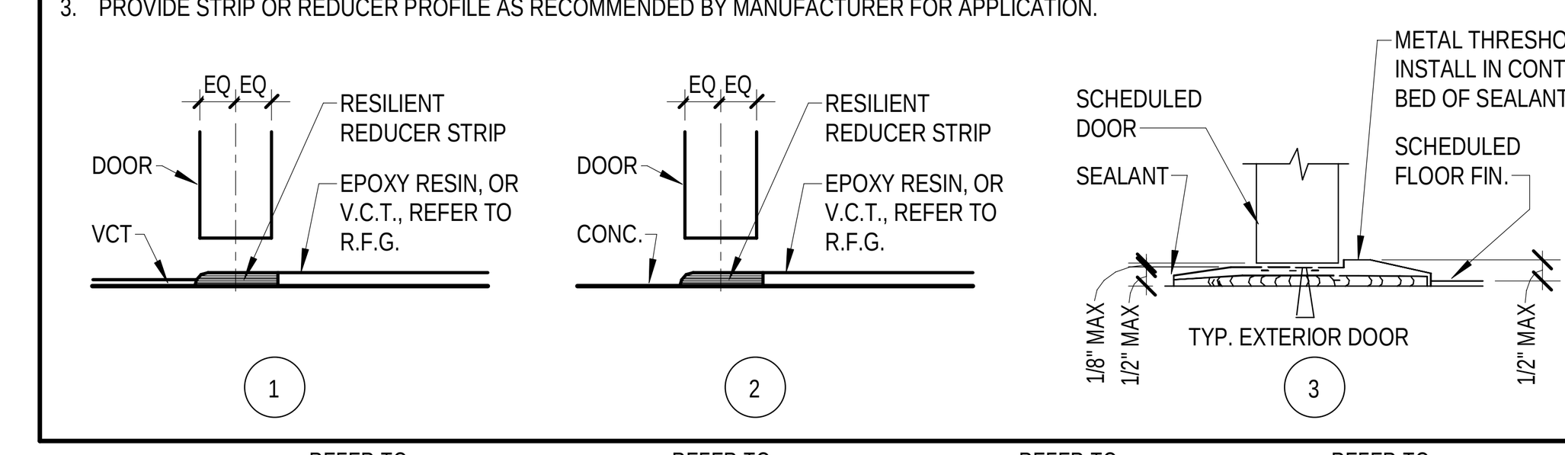
HARDWARE NOTES:
1. PROVIDE AND INSTALL ALL HARDWARE IN ACCORDANCE WITH ICC A117.1 - 2009.

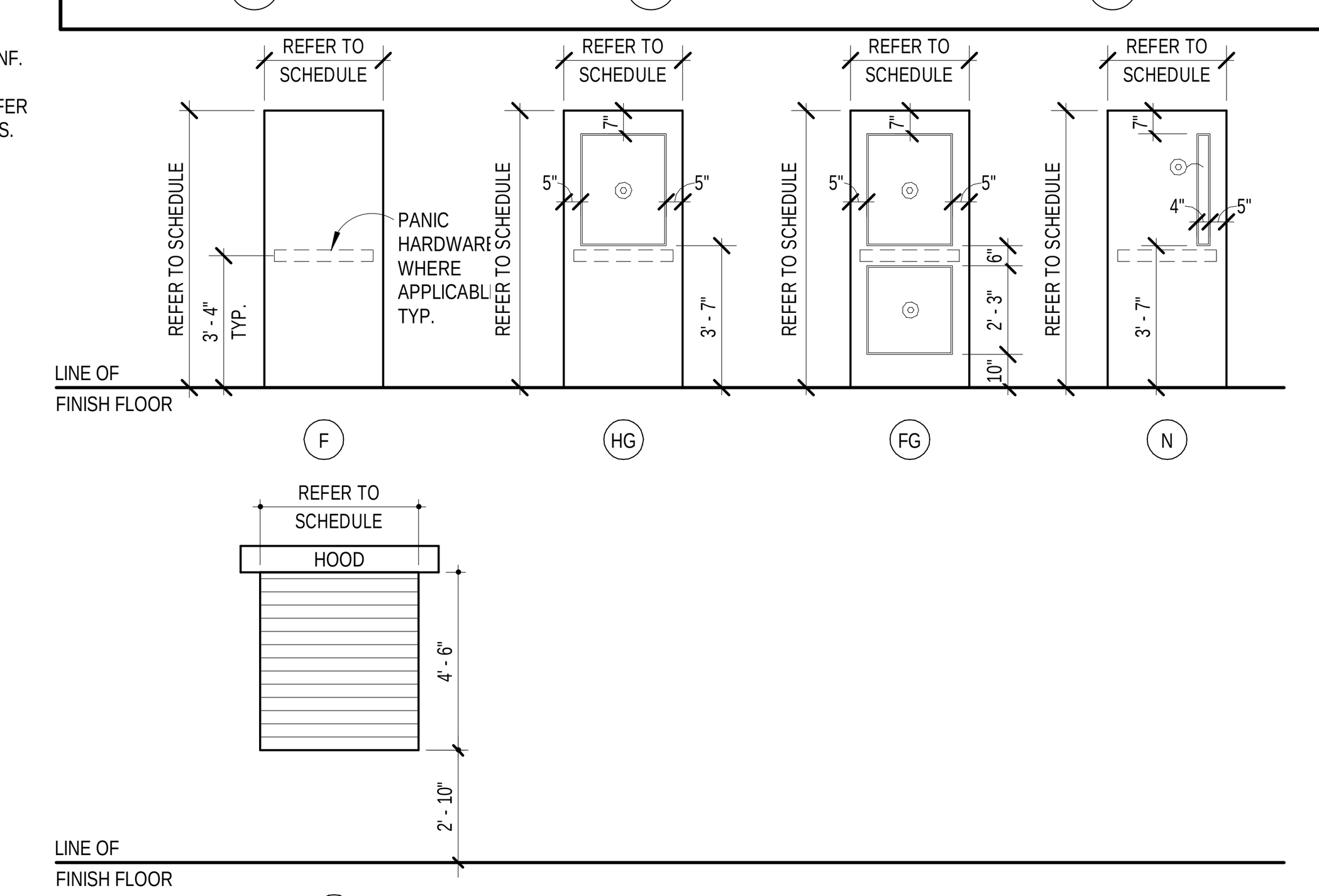
DOOR SCHEDULE REMARKS:

1. GALVANIZED HM DOOR, FRAME AND CAP / CLOSURE AT TOP OF HM DOOR.
2. FULLY INSULATE DOOR AND FRAME.
3. WEATHERSTRIPPING.
4. REMOVABLE MULLION.
5 REINFORCE DOOR AND FRAME FOR SCHEDULED HARDWARE.
6. WINDOW SHADES IN CAVITY OF INSULATED GLASS.
7. PROVIDE MFR STANDARD DETAILS FOR A FULL ASSEMBLY.
8. PANIC DEVICE(S).
9. NOT USED.
10. KICKPLATE.
11. THUMBTURN LOCK WITH OCCUPANCY INDICATOR.
12. ARMOR KICKPLATE.
13. PUSH PLATE ON INGRESS SIDE.
14. PROVIDE NEW DOOR AND HARDWARE IN EXISTING FRAME. CONFIRM DIMENSIONS. MODIFY FRAME AS NEEDED.
15. SPRING HINGES.
16. CARD READER.
17. DOOR BELL WITH STROBE LIGHT. WINDOW SHADES IN CAVITY BETWEEN.
18. CARD READER WITH VIDEO. PROVIDE CONDUIT AND WIRING TO NEW RECEPTION DESK.
19. BOTTOM VISION LIGHT OF THE DOOR (FG) IS TO BE OPAQUE CERAMIC FRIT GLASS.

THRESHOLD DETAIL CONDITIONS

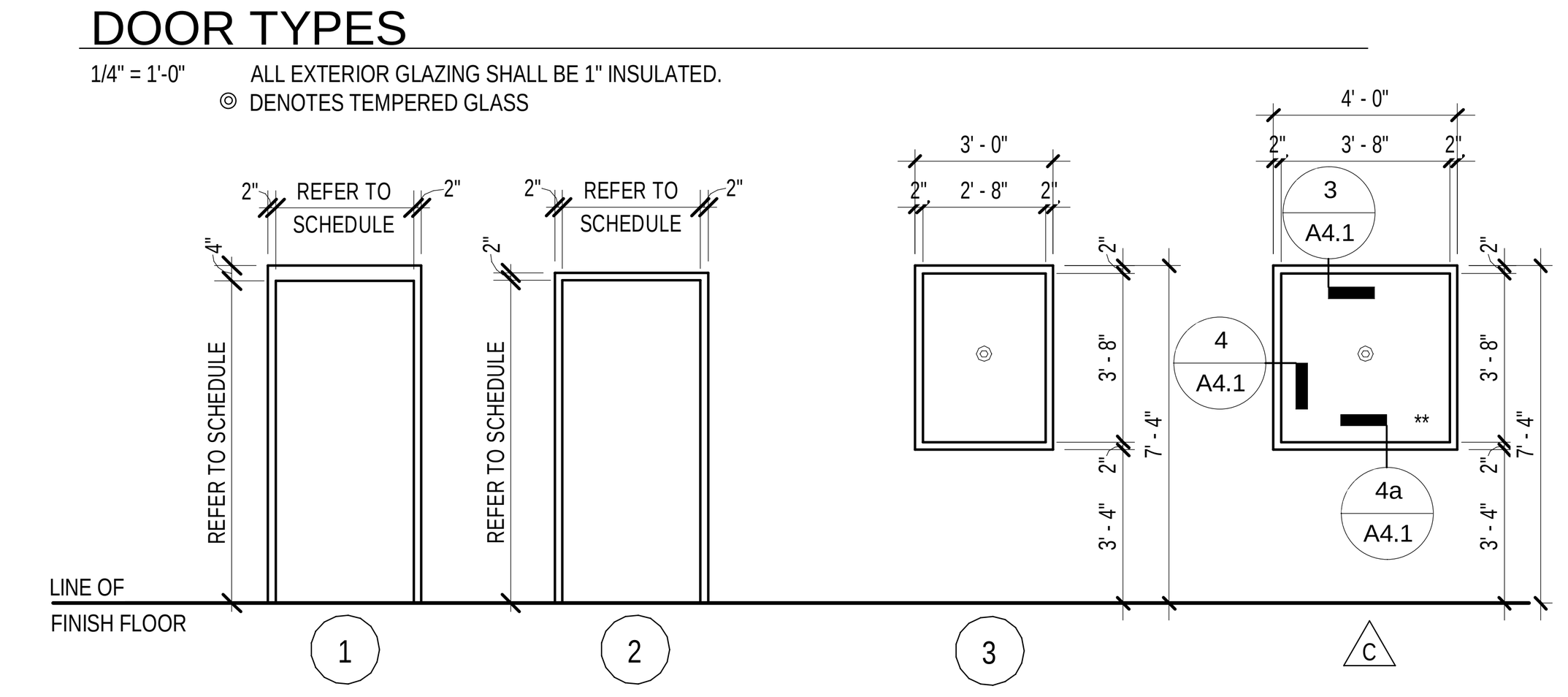
GENERAL NOTES:
1. REFER TO ROOM FINISH GROUPS AND FLOOR PLANS FOR FINISHES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAKE SURE THE PROPER THRESHOLD IS USED.
2. PROVIDE RESILIENT TRANSITION STRIPS OR REDUCERS BETWEEN ALL DIFFERING FLOOR FINISH MATERIALS.
3. PROVIDE STRIP OR REDUCER PROFILE AS RECOMMENDED BY MANUFACTURER FOR APPLICATION.





DOOR TYPES

1/4" = 1'-0" ALL EXTERIOR GLAZING SHALL BE 1" INSULATED.
DENOTES TEMPERED GLASS



HOLLOW METAL FRAME TYPES

1/4" = 1'-0" ALL EXTERIOR GLAZING SHALL BE 1" INSULATED, U.N.O.
DENOTES TEMPERED GLASS
DASHED LINES INDICATE INTERNAL REINFORCING LOCATIONS

** NOTE: PROVIDE 1-WAY (HALF-SILVERED MIRROR GLASS) AT FRAME TYPE - C IN ROOM 178.

SHERMAN CARTER BARNHART ARCHITECTS

M. SMITH - K. STANFIELD REGISTERED ARCHITECTS NO. 3323 / 6693 COMMONWEALTH OF KENTUCKY

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

DOOR SCHEDULE AND DOOR AND FRAME ELEVATIONS

JOB NO.	2210
DATE	08 / 03 / 23
DRAWN	FMS
CHECKED	TSS

REVISIONS

No.	Description	Date

SHEET
A4.1

2210
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/3/2023 3:02:41 PM

EXISTING FIRE HYDRANT FLOW TEST DATA

STATIC PSI: --

RESIDUAL PSI: --

FLOW: ----- GPM

DURATION: CONTINUOUS

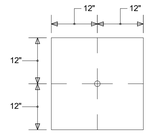
DATE & TIME: ----

LOCATION: ------

SOURCE OF WATER: -----

SOURCE OF DATA: ------

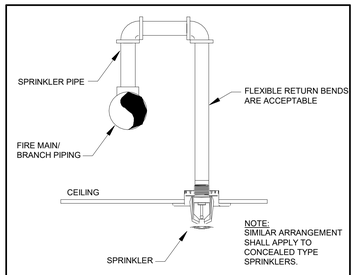
OCCUPANCY OF BUILDING: ------



SPRINKLERS TO BE INSTALLED
IN
CENTER OF 2x2 CEILING TILES.

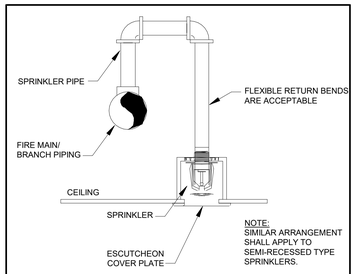
2x2 CEILING TILE DETAIL

NTS



RETURN BEND DETAIL

NTS



RETURN BEND DETAIL

NTS

GENERAL FIRE PROTECTION NOTES:

A. THE ENTIRE BUILDING SHALL BE 100% PROTECTED WITH A FULLY AUTOMATIC FIRE PROTECTION SYSTEM DESIGNED IN ACCORDANCE WITH NFPA (13), STATE AND LOCAL CODES.

B. THE SUCCESSFUL FIRE PROTECTION CONTRACTOR SHALL OBTAIN AND UTILIZE ALL APPLICABLE ARCHITECTURAL FLOOR PLANS, SECTIONS, AND REFLECTED CEILING PLANS FOR LAYING OUT SPRINKLERS. REFER TO A COMPLETE SET OF DOCUMENTS (ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND ELECTRICAL PLANS AND SPECIFICATIONS FOR COORDINATION OF TRADES, ROOMS, STRUCTURE, AND EQUIPMENT).

C. ALL AREAS ARE TO BE PROVIDED WITH QUICK RESPONSE SPRINKLERS (EXCEPTIONS PER NFPA SHALL BE APPLIED, IE MECHANICAL SPACES, ETC.). REFER TO FLOOR PLANS FOR LOCATIONS AND SPECIFICATIONS FOR ACCEPTABLE MANUFACTURERS AND MODELS.

D. ALL SPRINKLERS LOCATIONS SHALL BE COORDINATED WITH ALL OTHER CEILING RELATED DEVICES. REFER TO ARCHITECTURAL DRAWINGS FOR ADDITIONAL INFORMATION RELATED TO CEILING CONSTRUCTION.

E. WHERE CEILINGS ARE INDICATED, ALL SPRINKLER PIPING MUST BE INSTALLED ABOVE CEILINGS. SPRINKLER PIPING MUST BE COORDINATED WITH OTHER TRADES. PIPING MUST OFFSET AS REQUIRED TO AVOID CONFLICTS WITH DUCTWORK, CONDUIT, ALL EQUIPMENT, ETC.

F. HVAC DUCTWORK MAINS SHALL BE INSTALLED PRIOR TO FIRE PROTECTION PIPING. PROVIDE DRAIN VALVES IN THE FIRE PROTECTION SYSTEM WHERE NECESSARY TO COMPLETELY DRAIN THE SYSTEM.

G. PROVIDE ALL REQUIRED DRAIN PIPING TO TEST FLOW SWITCHES. DISCHARGE DRAIN PIPING TO OUTDOORS OR NOTED LOCATIONS.

H. SIZE ALL FIRE PROTECTION PIPING IN ACCORDANCE WITH NFPA 13. PIPE SIZING SHALL BE ACCOMPLISHED USING HYDRAULIC CALCULATIONS.

I. CONTRACTOR TO PROVIDE UPDATED FLOW TEST. SUBMIT HYDRAULIC CALCULATIONS AND SYSTEMS DESIGN FOR REVIEW TO THE M/E ENGINEER.

J. THE SPARE SPRINKLERS, WRENCH AND CABINET SHALL BE LOCATED ADJACENT TO THE FIRE SERVICE ENTRY.

K. ONLY CERTIFIED TECHNICIANS APPROVED BY THE LOCAL WATER COMPANY SHALL INSTALL OR TEST BACKFLOW PREVENTERS.

L. CERTIFIED CONTRACTOR SHALL TEST BACKFLOW PREVENTER AFTER INSTALLATION, PROVIDE TEST RESULTS (INCLUDE IN OPERATION AND MAINTENANCE MANUALS).

M. BUILDING SHALL BE CLASSIFIED AS LIGHT/ORDINARY HAZARD. LIGHT HAZARD AREAS (IE. GENERAL POPULATION, OFFICES, RESTROOM, ETC.) SHALL BE PROVIDED WITH A SPRINKLER DENSITY OF 0.10GPM/1500 SQFT. ORDINARY HAZARD GROUP I AREAS (SEE BELOW) SHALL BE PROVIDED WITH A SPRINKLER DENSITY OF 0.15GPM/1500 SQFT. AREA REDUCTION METHOD SHALL NOT BE APPLIED. COORDINATE ALL REQUIRED SPRINKLER DENSITIES WITH THE OWNERS INSURANCE UNDERWRITER AND USE THE GREATER. PROVIDE PLACARD AT INCOMING FIRE SERVICE.

THE FOLLOWING AREAS SHALL BE ORDINARY HAZARD:

A. STORAGE ROOMS (GROUP I)
B. MECHANICAL ROOMS (GROUP I)
C. ELECTRICAL ROOMS (GROUP I)
D. CUSTODIAN/JANITOR ROOMS (GROUP I)
E. PLATFORMS/STAGE (GROUP II)
F. CAFETORIUM (GROUP II)
G. GYMNASIUM (GROUP II)
H. KILN ROOM (GROUP I)
I. MDF AND IDF (IT) ROOMS (GROUP I)
J. ELEVATOR MACHINE ROOMS (GROUP I)

N. COORDINATE ALL SPRINKLER PIPE ROUTINGS WITH ALL ELECTRICAL EQUIPMENT.

O. THE CONTRACTOR SHALL INSURE THAT ALL PENETRATIONS OF THE AIR BARRIER BE SEALED TO MAINTAIN AN AIR TIGHT BUILDING.

P. FLOOR CONTROL VALVE ASSEMBLIES FOR EACH FIRE ZONE SHALL CONSIST OF, BUT ARE NOT LIMITED TO THE FOLLOWING: SUPERVISED ISOLATION VALVE, CHECK VALVE, FLOW SWITCH, PRESSURE GAUGE, DRAIN, AND TEST DRAIN WITH ORIFICE SIZED FOR FLOW OF A SINGLE SPRINKLER.

Q. ALL AREAS HAVING CEILING SHALL BE PROVIDED WITH RECESSED PENDANT STYLE SPRINKLERS UNLESS NOTED OTHERWISE.

R. COLOR FINISHES OF ALL SPRINKLERS/ESCUTCHEONS/COVER PLATES SHALL BE COORDINATED WITH ARCHITECT.

S. ALL AREAS HAVING NO CEILINGS SHALL BE PROVIDED WITH UPRIGHT TYPE SPRINKLERS.

T. ARCHITECTURAL REFLECTED CEILING PLANS SHALL BE UTILIZED AS AN AID IN LOCATING SPRINKLERS BUT DOES NOT RELIEVE THE SPRINKLER CONTRACTOR FROM PROVIDING A FULLY PROTECTED BUILDING SPRINKLER LAYOUT. CONTRACTOR SHALL ALSO COORDINATE ALL SPRINKLER LOCATION WITH ALL TRADE DRAWINGS (LIGHTING, FIRE ALARM, SECURITY, HVAC, ETC.)

U. COORDINATE LOCATIONS OF THE FOLLOWING FIRE PROTECTION APARATUS WITH THE LOCAL FIRE DEPARTMENT PRIOR TO INSTALLATION: FIRE DEPARTMENT CONNECTION (F.D.C.), POST INDICATOR VALVE (P.I.V.), FIRE ALARM BELLS, ETC. COORDINATION SHALL ALSO INCLUDE VERIFICATION OF ALL HOSE CONNECTION SIZES, THREAD TYPES.

V. ALL SPRINKLER DRAIN PIPING SHALL BE DISCHARGED TO THE BUILDING EXTERIOR AT AN APPROVED LOCATION OR TO A BUILDING DRAIN CAPABLE OF HANDLING FULL FLOW.

W. ALL SPRINKLERS LOCATED IN IDF/MDF, ELECTRICAL ROOMS, KILN ROOM AND KITCHEN SHALL BE HIGH TEMPERATURE SPRINKLERS WITH PROTECTIVE WIRE CAGES.

X. PROVIDE SPRINKLER COVERAGE BENEATH THE LOWEST LEVEL OF STAIR TREADS WHERE THE AREAS COULD BE UTILIZED FOR POTENTIAL STORAGE. SPRINKLER PIPING SHALL BE CONCEALED INSIDE WALLS AND UTILIZE SIDEWALL STYLE SPRINKLERS.

Y. PROVIDE SPRINKLER COVERAGE ABOVE AND BELOW FLOATING CLOUDS 48" OR GREATER IN SIZE. NO EXPOSED PIPING TO BE LOCATED BELOW ANY SUSPENDED CEILING ASSEMBLIES.

Z. PROVIDE GUARDS ON SPRINKLERS IN STORAGE ROOMS, ELECTRICAL ROOMS, JANITORS CLOSETS, AND GYMNASIUM. GUARDS ARE ALSO REQURED ON ANY SPRINKLERS WITHIN 7'-6" OF FINISH FLOOR.

SHERMAN CARTER BARNHART ARCHITECTS

COMMONWEALTH OF KENTUCKY
WILLIAM EPPS, JR.
PE-19127
REGISTERED PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company
1001 Wilkinson Blvd | Frankfort, KY 40601 | 502.695.1178

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

FIRE PROTECTION LEGENDS AND DETAILS

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	AME
CHECKED	JRE

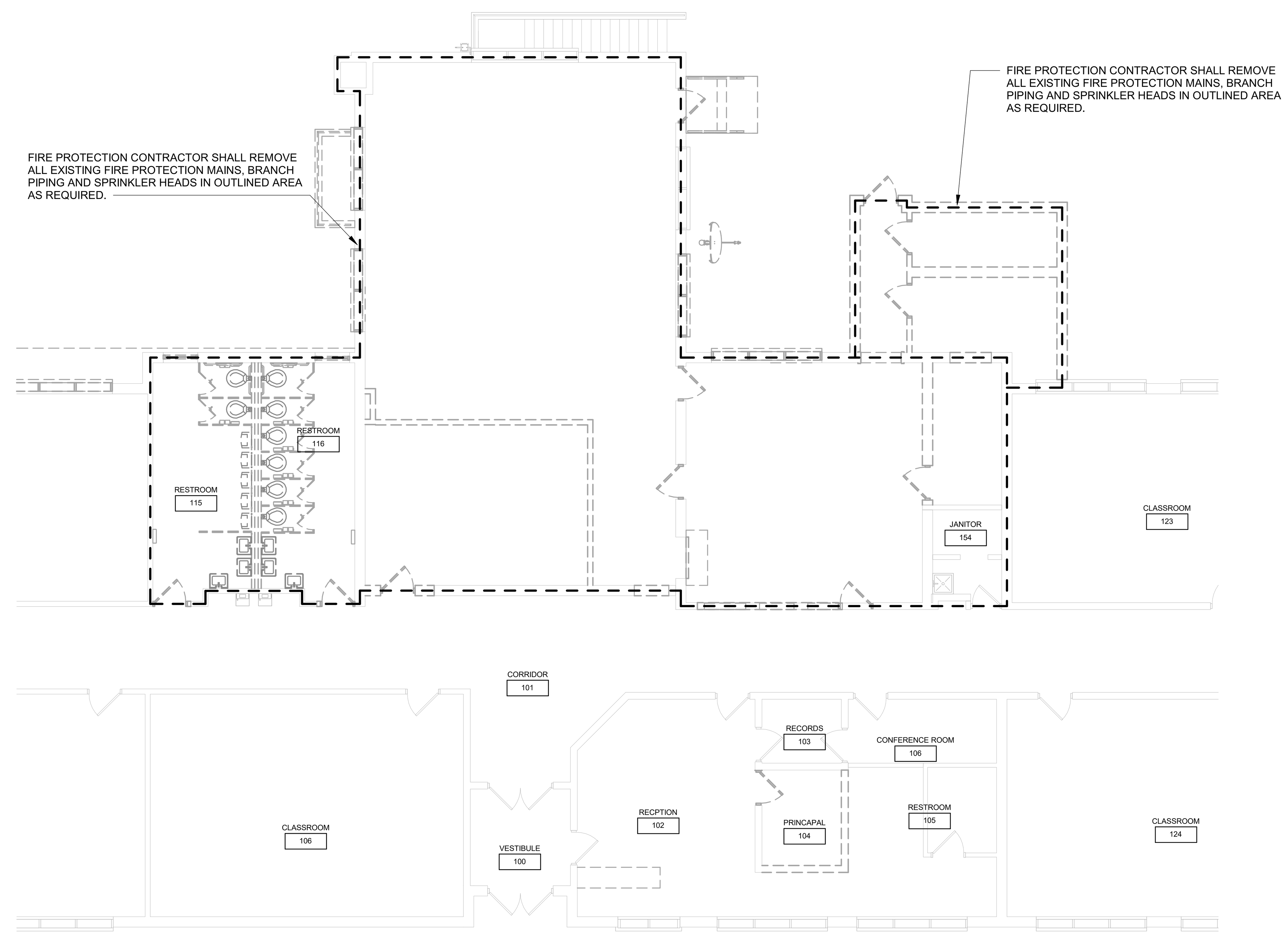
REVISIONS

No.	Description	Date

SHEET

FP0.1

SHERMAN CARTER BARNHART ARCHITECTS



1 FIRST FLOOR PLAN - FIRE PROTECTION DEMOLITION

NO SCALE

STATE OF KENTUCKY
WILLIAM EPPS, JR.
PE-19127
PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

FIRST FLOOR PLAN - FIRE PROTECTION DEMOLITION

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	AME
CHECKED	JRE

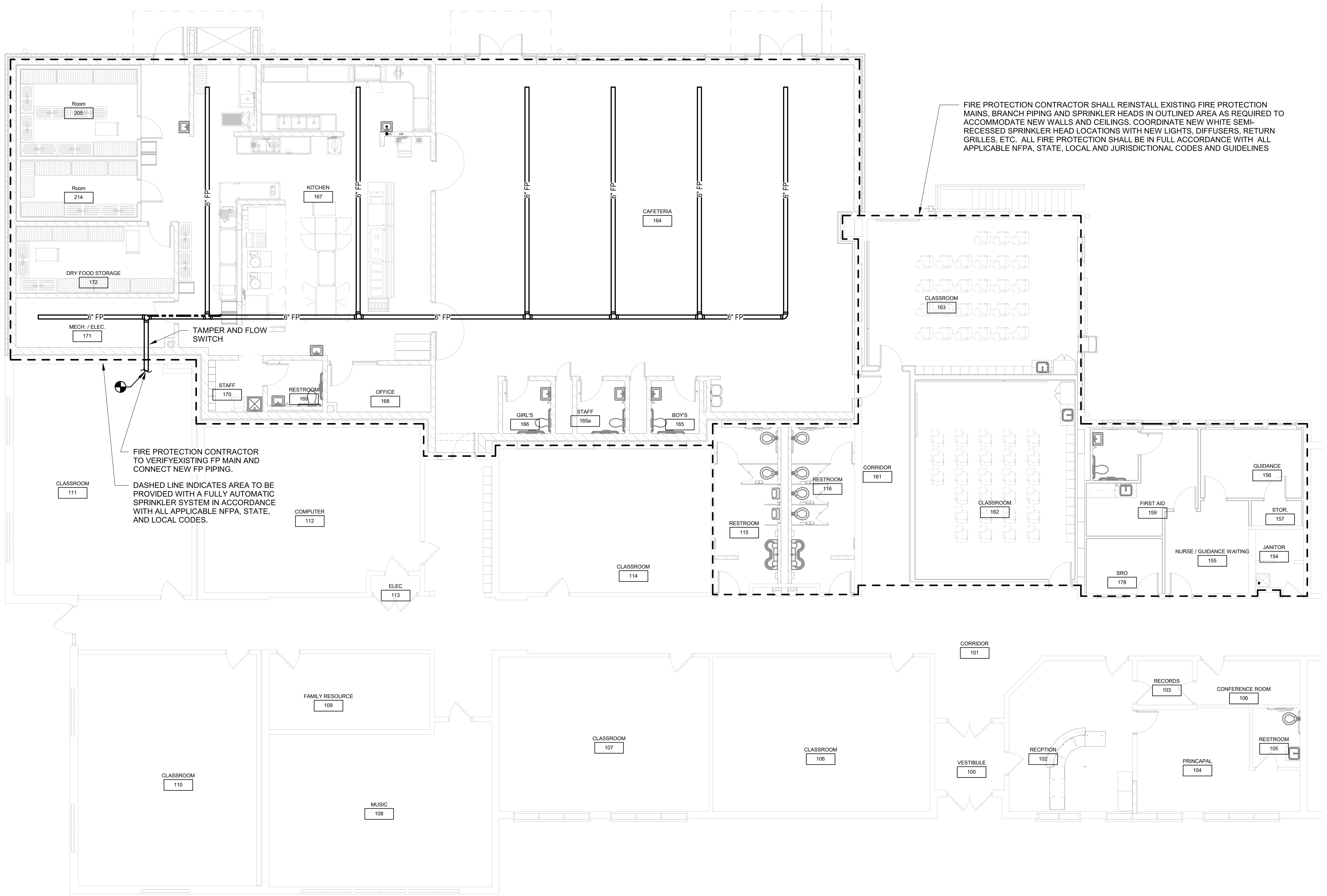
REVISIONS

No.	Description	Date

SHEET

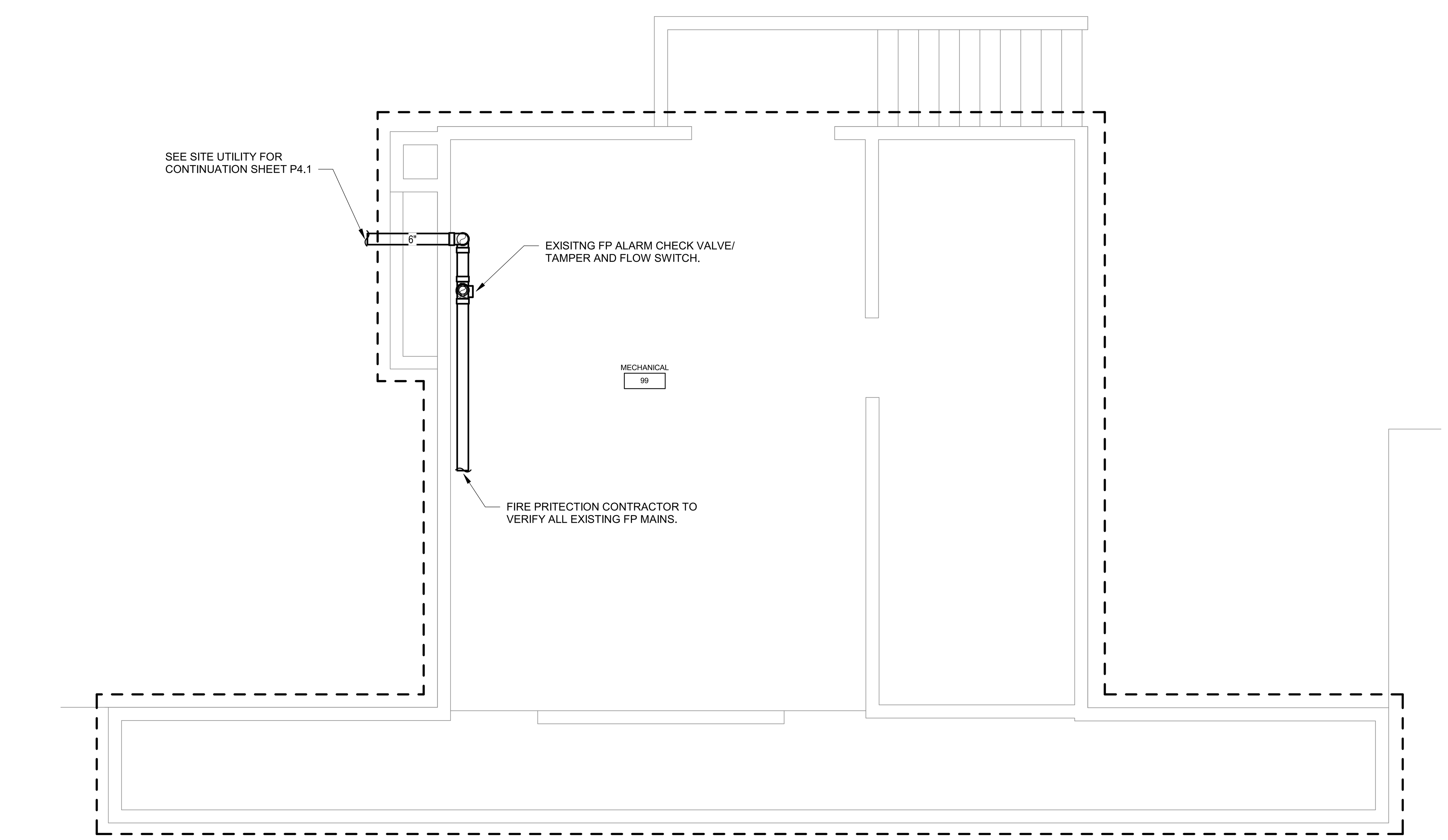
FP1.0

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:23 PM



1 FIRST FLOOR PLAN -FIRE PROTECTION

SCALE: 1/8" = 1'-0"



2 ENLARGED BASEMENT PLAN - FIRE PROTECTION

NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

CMTA
A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION
BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

FIRST FLOOR PLAN -FIRE PROTECTION

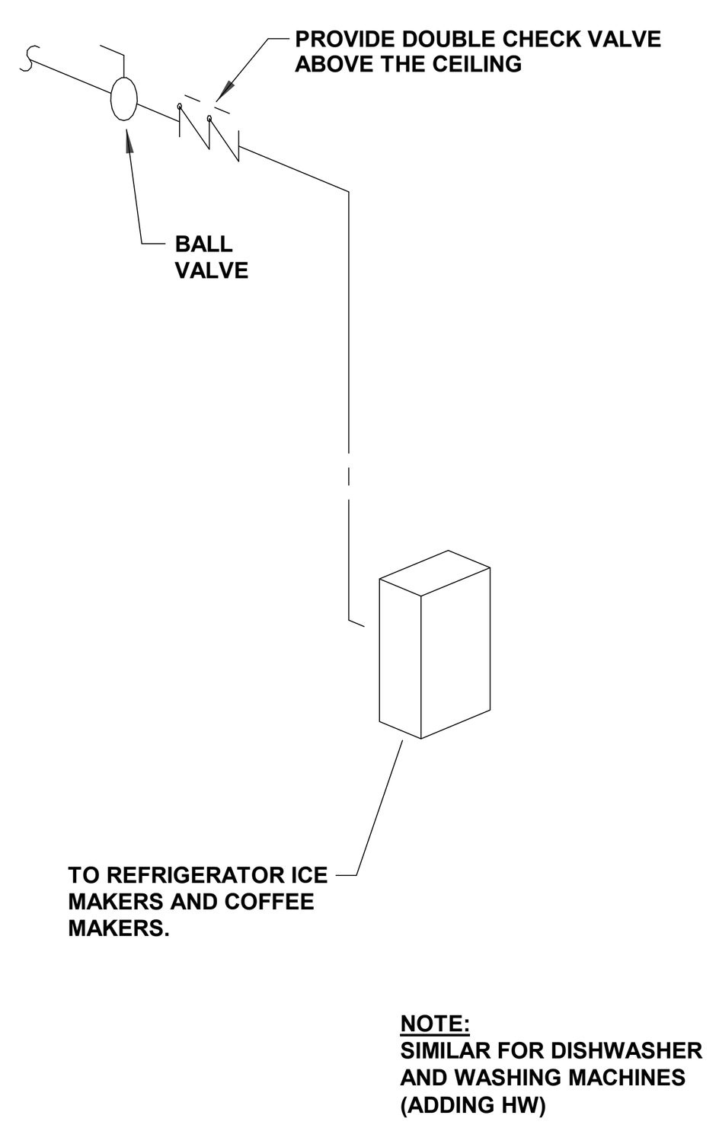
JOB NO.	1506.2
DATE	08/03/2023
DRAWN	AME
CHECKED	JRE

REVISIONS

No.	Description	Date

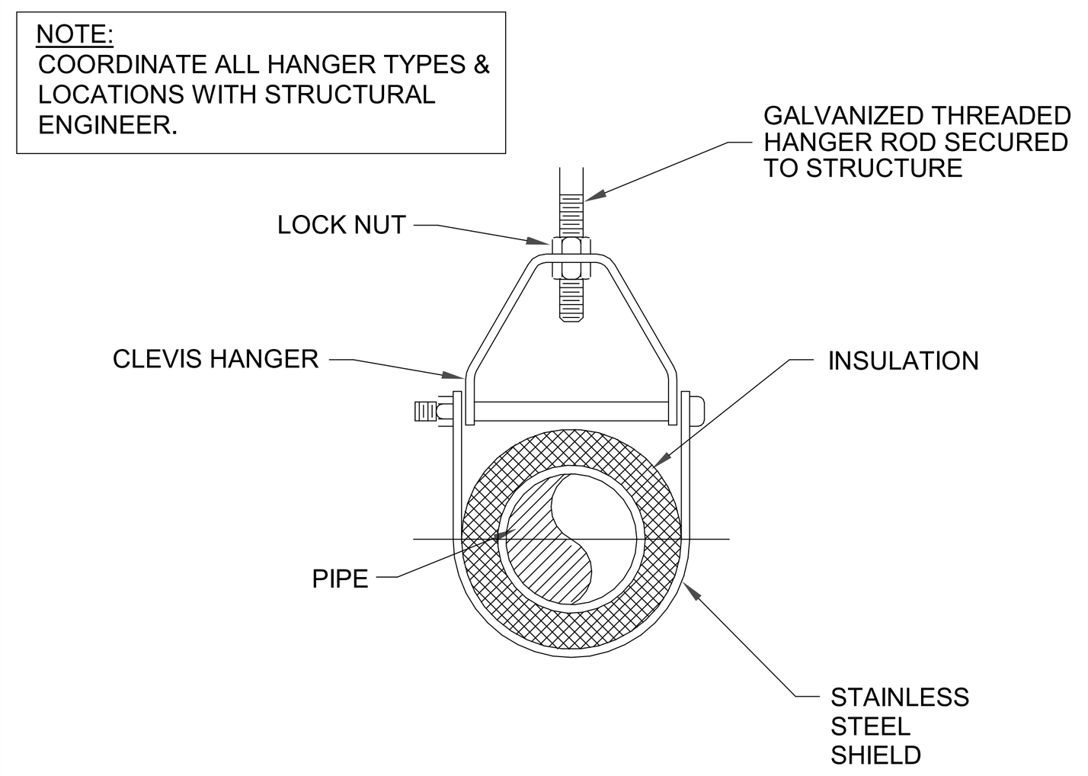
SHEET
FP1.1

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:24 PM



CONNECTION BOX DETAIL (P-8A)

NOT TO SCALE



PIPE HANGER DETAIL

NOT TO SCALE

PLUMBING FIXTURE SCHEDULE

DESIGNATOR	FIXTURE	CW	HW	SAN	VENT
P-1	WATER CLOSET - WALL MOUNT, MANUAL OPERATED FLUSH VALVE, 1.28 GPF	1½"	--	4"	2"
P-1A	WATER CLOSET - WALL MOUNT, MANUAL OPERATED FLUSH VALVE, 1.28 GPF, ADA	1½"	--	4"	2"
P-1B	WATER CLOSET - FLOOR MOUNT, MANUAL OPERATED FLUSH VALVE, 1.28 GPF, ADA	1½"	--	4"	2"
P-2A	LAVATORY - WALL HUNG, GOOSENECK WITH MANUAL WRIST BLADE HANDLES, 0.5 GPM, ADA	½"	½"	1½"	1½"
P-2B	LAVATORY - WALL HUNG, BASIN, ADA	½"	½"	1½"	1½"
P-4	STAINLESS STEEL SINGLE COMPARTMENT SINK - COUNTERTOP DROP-IN, GOOSENECK FAUCET WITH MANUAL WRIST BLADE HANDLES, 1.0 GPM, ADA	½"	½"	1½"	1½"
P-3	URINAL - WALL HUNG	¾"	--	2"	1½"
P-3A	URINAL - WALL HUNG, ADA	¾"	--	2"	1½"
P-5	DRINKING FOUNTAIN, DUAL HEIGHT, BOTTLE FILLING STATION, FILTERED, ADA	½"	--	1½"	1½"
P-6	24"x24" MOP SINK	¾"	¾"	3"	1½"
FD-1	FLOOR DRAIN - RESTROOM GROUP	--	--	3"	2"
FD-2	FLOOR DRAIN - KITCHEN	--	--	4"	2"
FD-3	FLOOR DRAIN - MECHANICAL ROOM. PROVIDE TRAP PRIMER CONNECTION	--	--	4"	2"
FS-1	FLOOR SINK - KITCHEN	--	--	4"	2"
FPWH	FREEZE-PROOF WALL HYDRANT - RECESSED IN LOCKABLE ENCLOSURE	¾"	--	--	--
HB	HOSE BIBB - RECESSED IN LOCKABLE ENCLOSURE	¾"	--	--	--

NOTES:

- PIPE SIZES ARE AS INDICATED UNLESS OTHERWISE NOTED ON FLOOR PLANS AND RISER DIAGRAMS.
- MINIMUM 2" SANITARY PIPING UNDERGROUND.
  PROVIDE ALL REQUIRED PIPING TO FIXTURES INDICATED ON THE FLOOR PLANS, INDICATED WITH A "P" DESIGNATION. PROVIDE PIPING OF SIZE INDICATED IN THIS SCHEDULE.
- PIPE ALL EQUIPMENT (SUPPLIED BY OTHERS) AS REQUIRED TO OBTAIN A FULL AND OPERATIONAL SYSTEM. PROVIDE BACKFLOW PROTECTION AS/IF REQUIRED BY THE DETAILS AND BY THE KENTUCKY PLUMBING CODE. ALL EQUIPMENT SHALL BE CONNECTED PER THE MANUFACTURER'S REQUIREMENTS. THE PLUMBING CONTRACTOR SHALL ALSO INSTALL ANY DRAIN PIPING CONNECTIONS AND SPILL INDIRECTLY TO EITHER AN OPEN RECEPTACLE OR FLOOR DRAIN. REFER TO ARCHITECTURAL PLANS FOR EXACT PLACEMENT OF ALL EQUIPMENT.

PLUMBING LEGEND

ABOVE FINISHED FLOOR	AFF
BELOW FINISHED FLOOR	BFF
CAST IRON	CI
CLEANOUT	CO
COLD WATER	CW
DOMESTIC WATER CIRCULATING PUMP	DP
ELECTRICAL CONTRACTOR	EC
EXPANSION TANK	ET
FLOOR DRAIN	FD
GENERAL CONTRACTOR	GC
HOSE BIBB	HB
HOT WATER	HW
INVERT ELEVATION	IE
MECHANICAL CONTRACTOR	MC
MIXING VALVE	MV
NOT TO SCALE	NTS
OPEN RECEPTACLE	OR
PLUMBING CONTRACTOR	PC
POLYVINYL CHLORIDE	PVC
ROOF DRAIN	RD
TYPICAL	TYP
VENT THROUGH ROOF	VTR
WATER HAMMER ARRESTOR	WHA
WATER HEATER	WH
EXISTING SANITARY PIPING	E(SAN)
EXISTING STORM PIPING	E(SS)
EXISTING OVERFLOW STORM PIPING	E(OSS)
EXISTING SANITARY VENT PIPING	E(V)
EXISTING DOMESTIC COLD WATER PIPING	E(CW)
SANITARY PIPING	SAN
STORM PIPING	SS
OVERFLOW STORM PIPING	OSS
SANITARY VENT PIPING	V
DOMESTIC COLD WATER PIPING	
DOMESTIC HOT WATER PIPING (120° F)	
DOMESTIC HOT WATER RETURN PIPING (120° F)	
RELIEF VALVE DISCHARGE	RVD
PRESSURE RELIEF VALVE	
UNION	
DIAL THERMOMETER	
PRESSURE GAUGE	
BALANCING VALVE	
CHECK VALVE	
DOUBLE CHECK VALVE ASSEMBLY	
BALL VALVE	
BALL VALVE IN RISER	
PIPING ELBOW (TURNED UP/DOWN)	
PIPING TEE (TURNED UP/DOWN)	
REDUCED PRESSURE BACKFLOW PREVENTER	
PRESSURE REDUCING VALVE	

RECIRCULATING PUMP

TAG	DP-1
MANUFACTURER	BELL & GOSSETT
MODEL	PL-36
SERVICE	120° LOOP
VOLTAGE / PHASE	115/1
HP	1/12
FLOW (GPM)	5.0
HEAD (FT.)	20.0
ALL BRONZE BODY	YES
100% LEAD FREE	YES

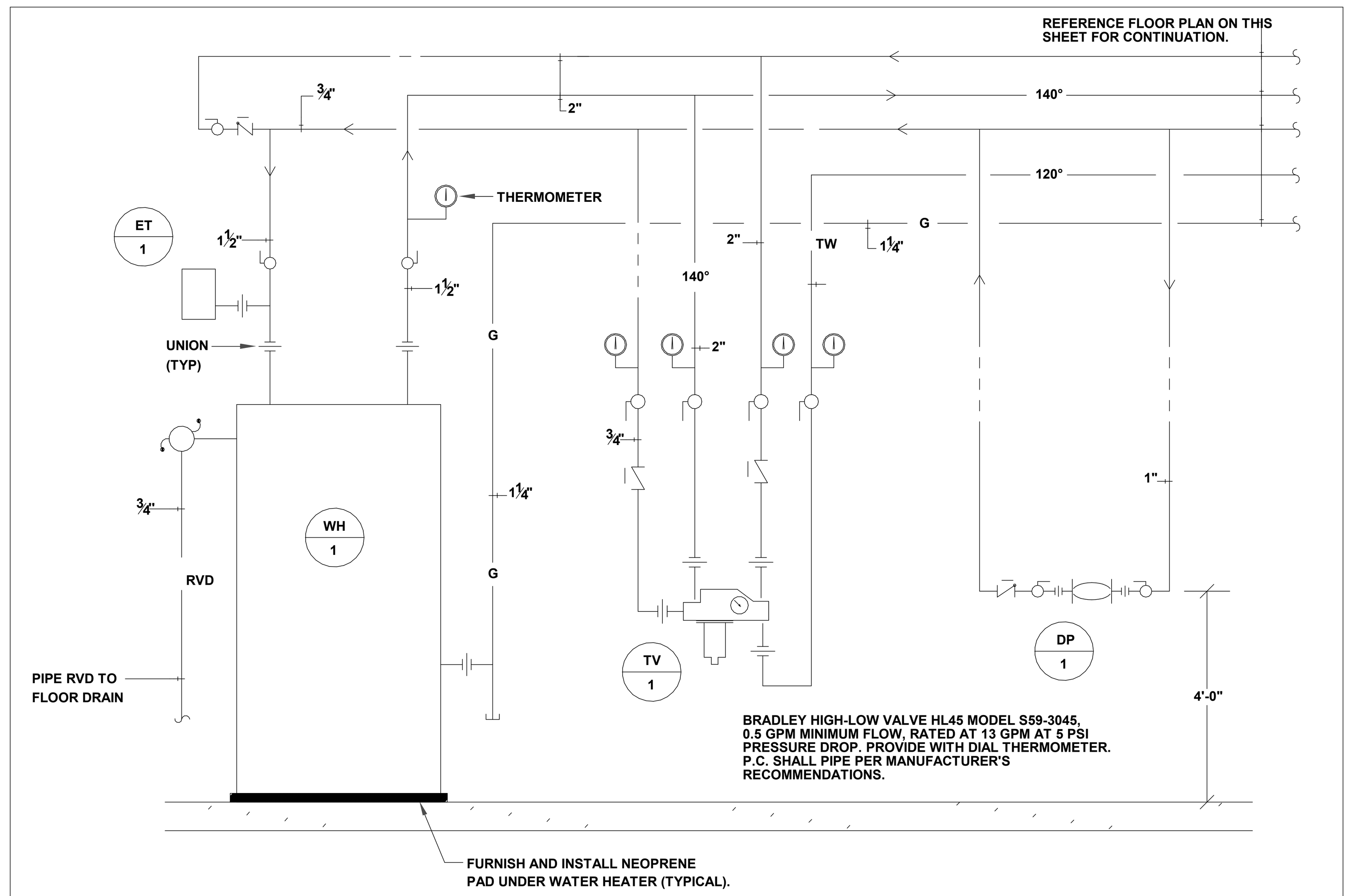
EXPANSION TANK

TAG	ET-1
MANUFACTURER	WATTS
MODEL	DETA-5
MAX PRESSURE (PSI)	150
MAX TEMPERATURE	240° F
TANK VOLUME-GAL.	3.5
TANK ACCEPTANCE-GAL.	1.3

WATER HEATER

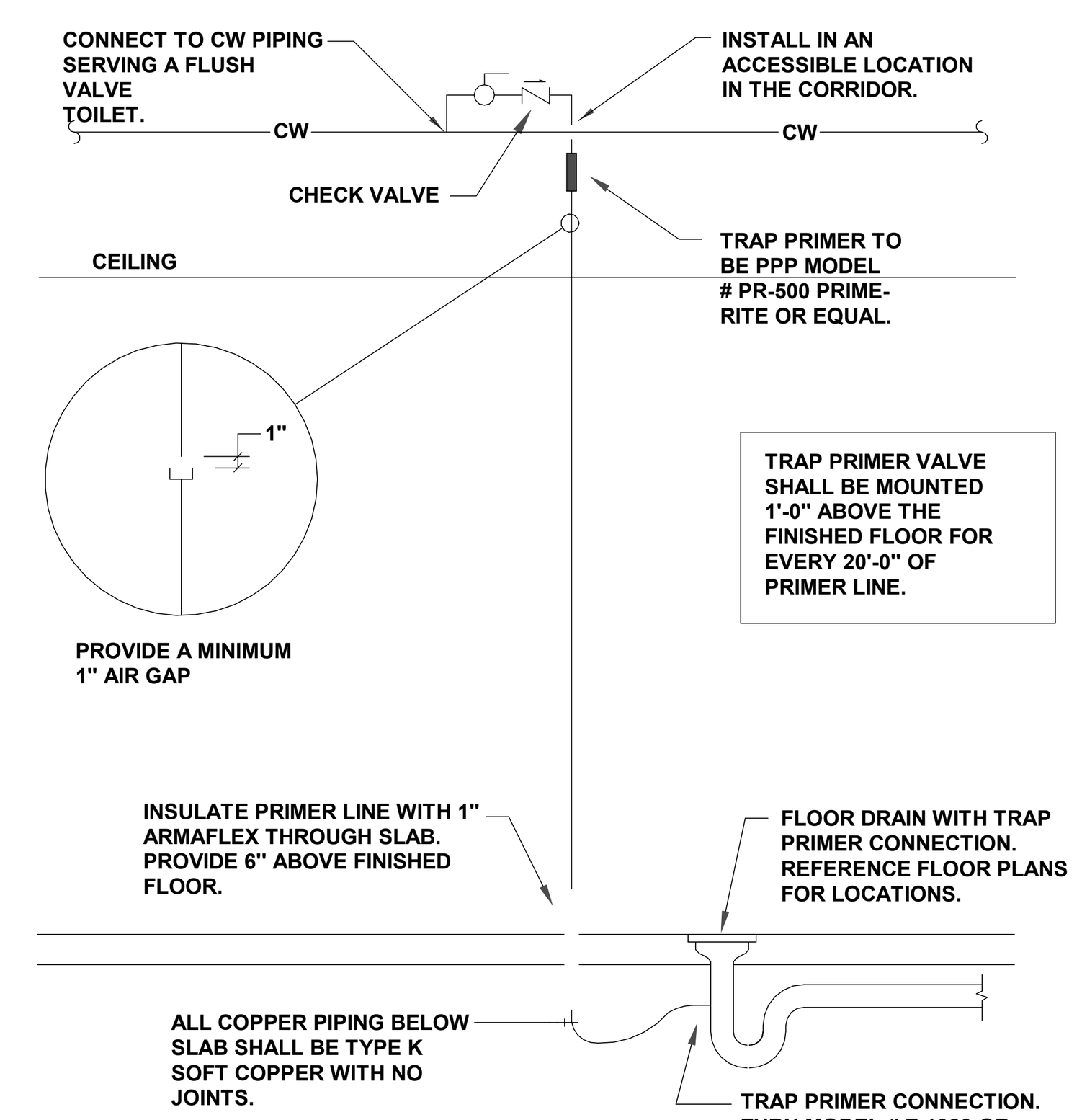
TAG	WH-1
MANUFACTURER	AO SMITH
MODEL	CYCLONE BTH-199
GAS INPUT (BTUH)	199,000
THERMAL EFFICIENCY	98%
GALLONS STORAGE	100
GPH RECOVERY @ 90° F	198
VOLTAGE / MAX FUSE	120V / 15 AMPS
ASME RATED	YES
UL LISTED	YES

* PROVIDE WITH 1 SPARE IGNITER PER WATER HEATER. TURN OVER TO OWNER.
* EQUAL WATER HEATER BY LOCHINVAR OR STATE
* PROVIDE WITH CONDENSATE NEUTRALIZATION KIT P/N 100112380 AS LISTED AS AN OPTION THROUGH MANUFACTURER.



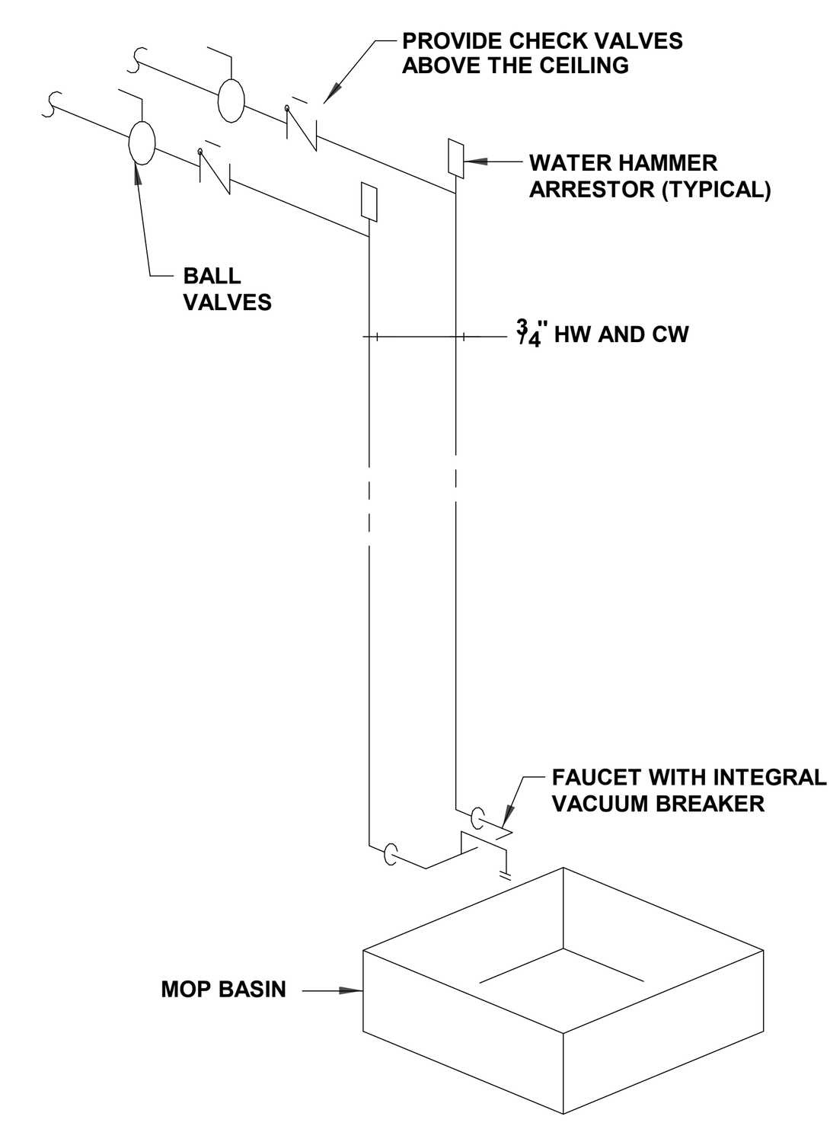
WATER HEATER PIPING SCHEMATIC

NOT TO SCALE



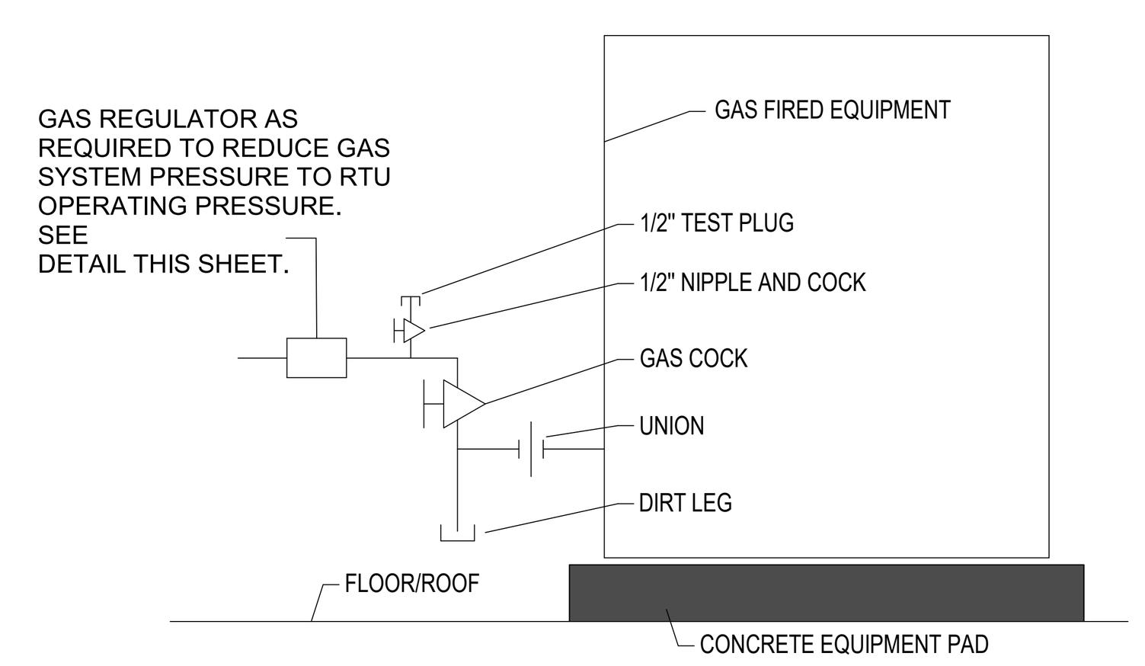
FLOOR DRAIN TRAP PRIMER PIPING SCHEMATIC

NOT TO SCALE



MOP BASIN DETAL (P-6)

NOT TO SCALE



TYPICAL GAS EQUIPMENT CONNECTION DETAIL

NOT TO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
WILLIAM EPPS, JR.
PE-19127
LICENSED PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

PLUMBING LEGEND AND DETAILS

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	AME
CHECKED	JRE

REVISIONS

No.	Description	Date

SHEET

P0.1

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:24 PM

GENERAL DEMOLITION NOTES:

A. INACCESSIBLE PIPING BURIED IN EXISTING WALLS REMAINING AND CONCRETE SLABS MAY BE ABANDONED IN PLACE.

B. ANY HOLES IN WALLS, FLOORS, CEILINGS, ROOFS, ETC. CREATED AS A RESULT OF THE PLUMBING SYSTEMS DEMOLITION SHALL BE PATCHED TO MATCH THE ADJACENT SURFACES. PATCH SHALL BE PERFORMED BY QUALIFIED TRADESMAN. REFER TO ARCHITECTURAL CUT AND PATCH SPECIFICATION FOR ADDITIONAL INFORMATION.

C. WHERE WORK IS REQUIRED ABOVE EXISTING CEILINGS AND/OR OUTSIDE OF THE SCOPE OF WORK AREA, THIS CONTRACTOR SHALL BE RESPONSIBLE FOR CUT, PATCH, REMOVAL, AND REINSTALLATION (OR REPLACEMENT IF DAMAGED) OF ALL CEILING TILES, HARD CEILINGS, AND GRID MEMBERS NECESSARY TO PERFORM THE WORK. THIS SHALL BE PERFORMED AT THIS CONTRACTOR'S EXPENSE. COORDINATE CLOSELY WITH THE ARCHITECT AND GENERAL CONTRACTOR. REFER TO ARCHITECTURAL DRAWINGS FOR NEW CEILING LOCATIONS.

D. VERIFY WITH OWNER PRIOR TO DEMOLITION IF ANY ITEMS ARE TO BE SALVAGED.

E. ALL SYSTEM SHUTDOWNS SHALL BE SCHEDULED WITH THE FACILITIES ENGINEER A MINIMUM OF 48 HOURS IN ADVANCE.

F. THE PLUMBING CONTRACTOR SHALL CLEAN UP CONSTRUCTION DEBRIS DURING AND AFTER PLUMBING DEMOLITION.

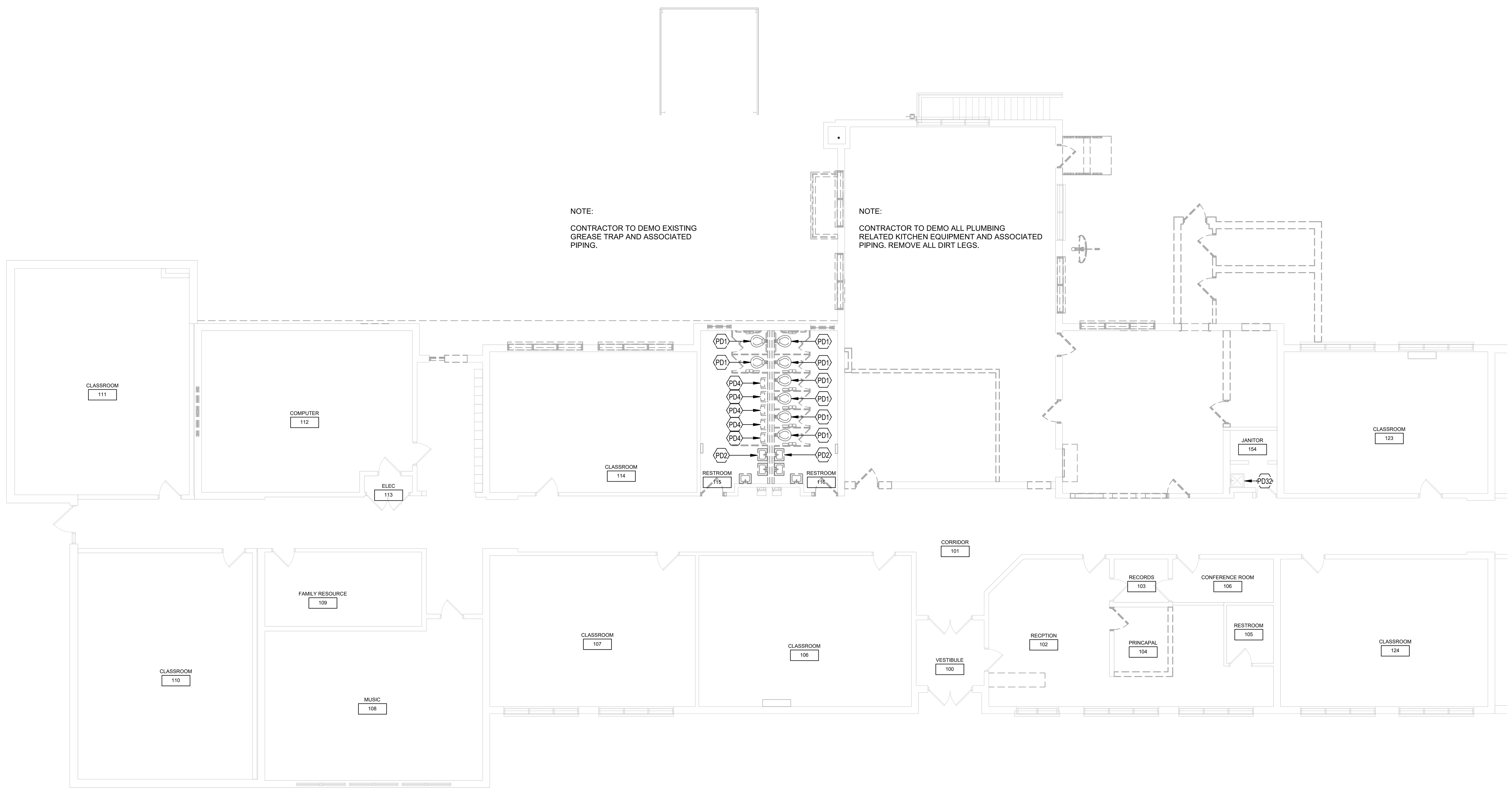
G. THE PLUMBING CONTRACTOR SHALL DISPOSE OF DEMOLISHED PLUMBING FIXTURES AND COORDINATE WITH THE GENERAL CONTRACTOR.

H. PRIOR TO STARTING THE DEMOLITION WORK, THE PLUMBING CONTRACTOR SHALL VERIFY WITH THE ELECTRICAL CONTRACTOR THAT POWER FEEDS AND CONTROL WIRING HAVE BEEN DISCONNECTED AND LOCKED OUT FROM PLUMBING EQUIPMENT WHICH IS TO BE REMOVED.

I. THE PLUMBING CONTRACTOR SHALL REPAIR OR REPLACE ANY DUCT OR PIPING INSULATION DAMAGED DURING DEMOLITION WORK.

J. THE PLUMBING CONTRACTOR SHALL AVOID DAMAGING EXISTING DOMESTIC AND SANITARY PLUMBING, HVAC SYSTEMS, ELECTRICAL SYSTEMS, ETC. IF ANY OF THESE SERVICES ARE DAMAGED, THE PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR AND/OR REPLACEMENT OF DAMAGED PLUMBING LINES, DUCTWORK, CONDUITS, BUILDING MATERIALS, ETC., AND CLEAN-UP OF AREA AFFECTED BY DAMAGED SYSTEM AT THE EXPENSE OF THE PLUMBING CONTRACTOR.

TAGGED NOTES	
PD1	REMOVE EXISTING WATER CLOSET AND ASSOCIATED SANITARY WASTE, VENT AND DOMESTIC WATER PIPING.
PD2	REMOVE EXISTING SINK AND ASSOCIATED SANITARY WASTE, VENT AND DOMESTIC WATER PIPING.
PD4	REMOVE EXISTING URINAL AND ASSOCIATED SANITARY WASTE, VENT AND DOMESTIC WATER PIPING.
PD32	EXISTING MOP BASIN TO REMAIN UN-TOUCHED



1 BELOW SLAB PLAN - PLUMBING DEMOLITION

NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY WILLIAM EPPS, JR. PE-19127 LICENSED PROFESSIONAL ENGINEER

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277

HART COUNTY BOARD OF EDUCATION

HORSE CAVE, KY

BELOW SLAB PLAN - PLUMBING DEMOLITION

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	AME
CHECKED	JRE

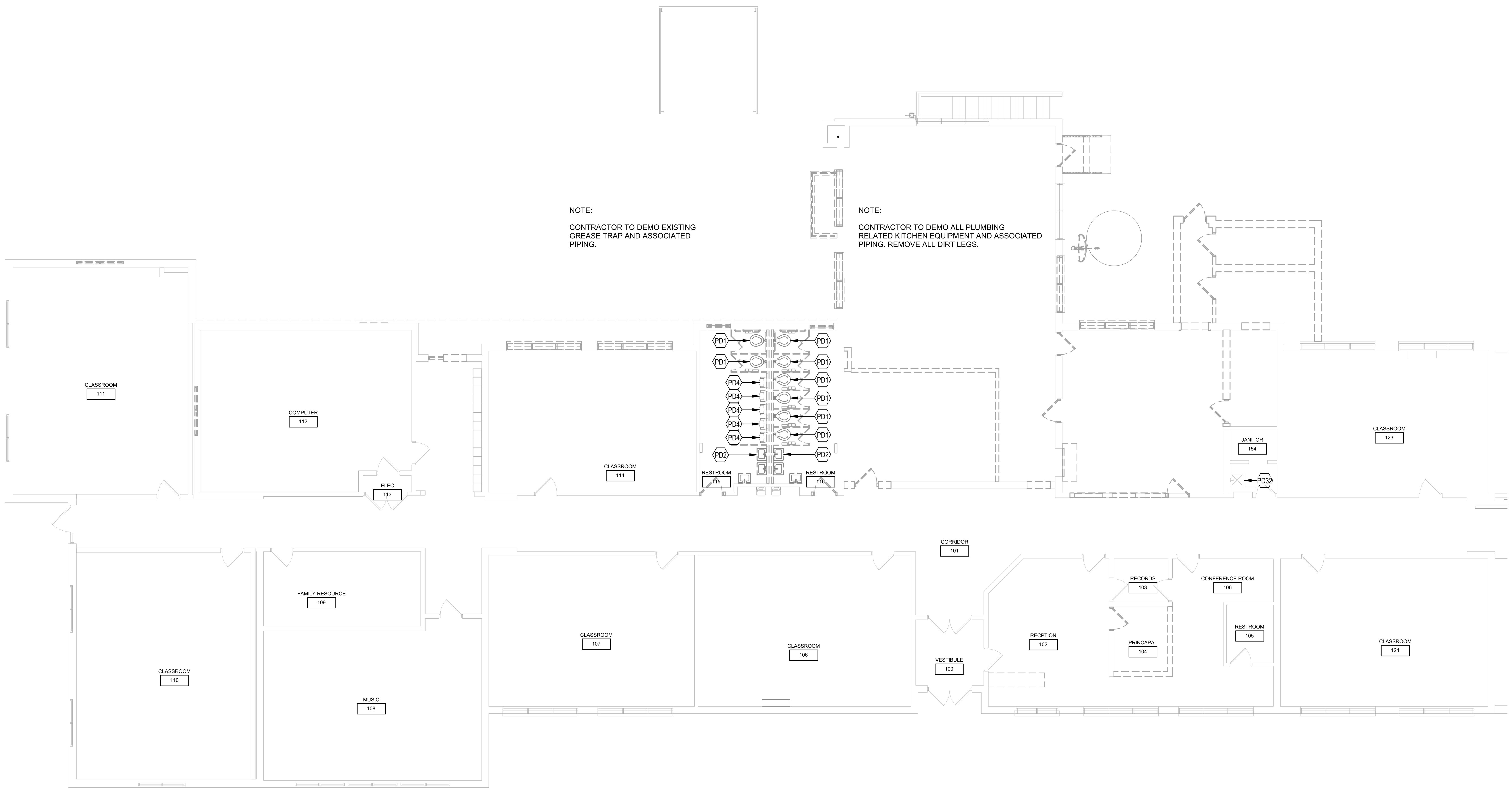
REVISIONS

No.	Description	Date

SHEET

P1.1

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:25 PM



1 FIRST FLOOR PLAN - PLUMBING DEMOLITION

NO SCALE

GENERAL DEMOLITION NOTES:

A. INACCESSIBLE PIPING BURIED IN EXISTING WALLS REMAINING AND CONCRETE SLABS MAY BE ABANDONED IN PLACE.

B. ANY HOLES IN WALLS, FLOORS, CEILINGS, ROOFS, ETC. CREATED AS A RESULT OF THE PLUMBING SYSTEMS DEMOLITION SHALL BE PATCHED TO MATCH THE ADJACENT SURFACES. PATCH SHALL BE PERFORMED BY QUALIFIED TRADESMAN. REFER TO ARCHITECTURAL CUT AND PATCH SPECIFICATION FOR ADDITIONAL INFORMATION.

C. WHERE WORK IS REQUIRED ABOVE EXISTING CEILINGS AND/OR OUTSIDE OF THE SCOPE OF WORK AREA, THIS CONTRACTOR SHALL BE RESPONSIBLE FOR CUT, PATCH, REMOVAL, AND REINSTALLATION (OR REPLACEMENT IF DAMAGED) OF ALL CEILING TILES, HARD CEILINGS, AND GRID MEMBERS NECESSARY TO PERFORM THE WORK. THIS SHALL BE PERFORMED AT THIS CONTRACTOR'S EXPENSE. COORDINATE CLOSELY WITH THE ARCHITECT AND GENERAL CONTRACTOR. REFER TO ARCHITECTURAL DRAWINGS FOR NEW CEILING LOCATIONS.

D. VERIFY WITH OWNER PRIOR TO DEMOLITION IF ANY ITEMS ARE TO BE SALVAGED.

E. ALL SYSTEM SHUTDOWNS SHALL BE SCHEDULED WITH THE FACILITIES ENGINEER A MINIMUM OF 48 HOURS IN ADVANCE.

F. THE PLUMBING CONTRACTOR SHALL CLEAN UP CONSTRUCTION DEBRIS DURING AND AFTER PLUMBING DEMOLITION.

G. THE PLUMBING CONTRACTOR SHALL DISPOSE OF DEMOLISHED PLUMBING FIXTURES AND COORDINATE WITH THE GENERAL CONTRACTOR.

H. PRIOR TO STARTING THE DEMOLITION WORK, THE PLUMBING CONTRACTOR SHALL VERIFY WITH THE ELECTRICAL CONTRACTOR THAT POWER FEEDS AND CONTROL WIRING HAVE BEEN DISCONNECTED AND LOCKED OUT FROM PLUMBING EQUIPMENT WHICH IS TO BE REMOVED.

I. THE PLUMBING CONTRACTOR SHALL REPAIR OR REPLACE ANY DUCT OR PIPING INSULATION DAMAGED DURING DEMOLITION WORK.

J. THE PLUMBING CONTRACTOR SHALL AVOID DAMAGING EXISTING DOMESTIC AND SANITARY PLUMBING, HVAC SYSTEMS, ELECTRICAL SYSTEMS, ETC. IF ANY OF THESE SERVICES ARE DAMAGED, THE PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR AND/OR REPLACEMENT OF DAMAGED PLUMBING LINES, DUCTWORK, CONDUITS, BUILDING MATERIALS, ETC., AND CLEAN-UP OF AREA AFFECTED BY DAMAGED SYSTEM AT THE EXPENSE OF THE PLUMBING CONTRACTOR.

TAGGED NOTES	
PD1	REMOVE EXISTING WATER CLOSET AND ASSOCIATED SANITARY WASTE, VENT AND DOMESTIC WATER PIPING.
PD2	REMOVE EXISTING SINK AND ASSOCIATED SANITARY WASTE, VENT AND DOMESTIC WATER PIPING.
PD4	REMOVE EXISTING URINAL AND ASSOCIATED SANITARY WASTE, VENT AND DOMESTIC WATER PIPING.
PD32	EXISTING MOP BASIN TO REMAIN UN-TOUCHED

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY WILLIAM EPPS, JR. PE-19127 PROFESSIONAL ENGINEER

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

FIRST FLOOR PLAN - PLUMBING DEMOLITION

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	AME
CHECKED	JRE

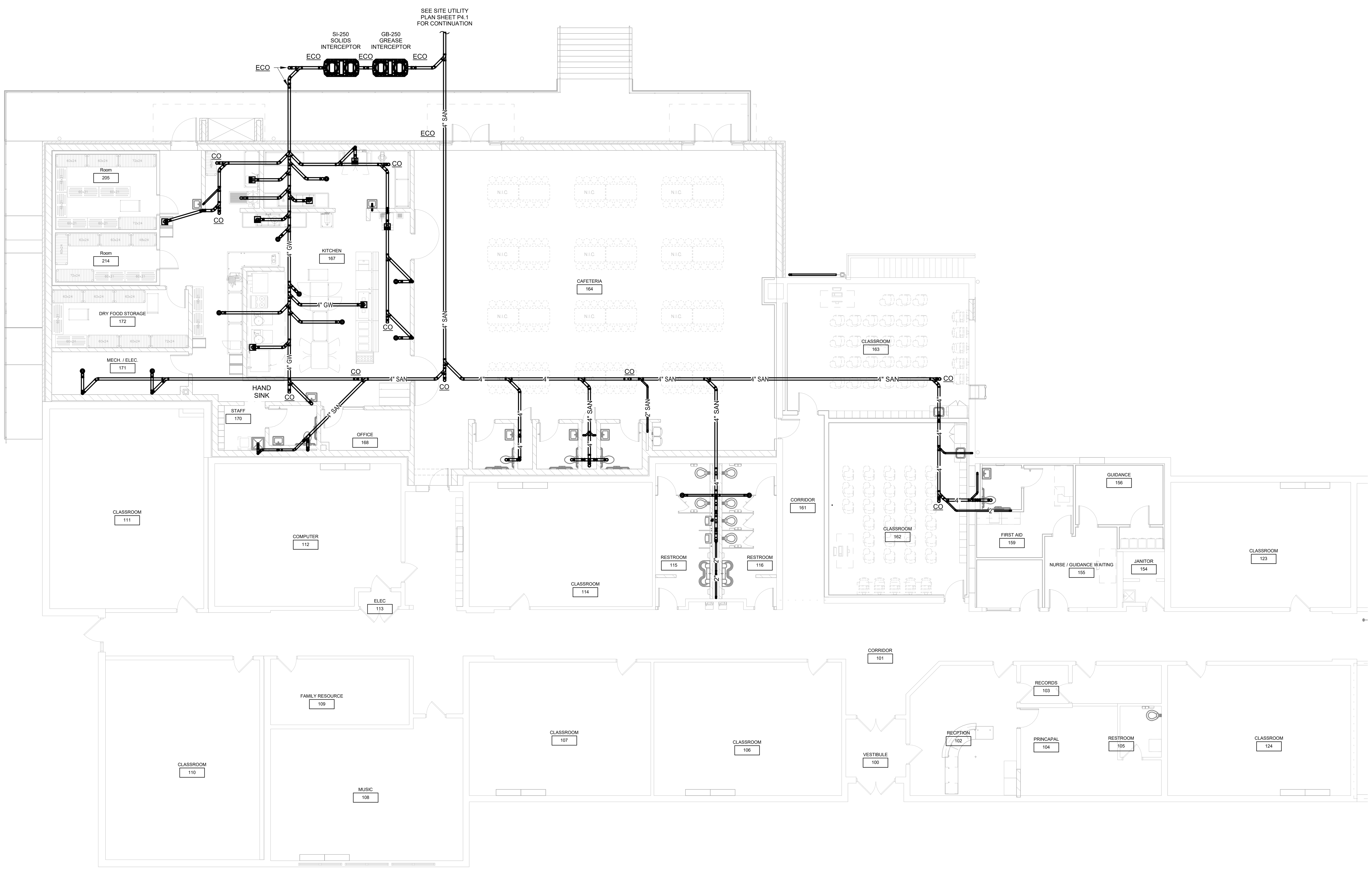
REVISIONS

No.	Description	Date

SHEET

P1.2

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:25 PM



1 BELOW-SLAB FLOOR PLAN - PLUMBING

SCALE: 1/8" = 1'-0"

GENERAL PLUMBING NOTES:

1. THE PLUMBING CONTRACTOR SHALL DETERMINE NECESSARY INVERT ELEVATIONS FOR PROPER DRAINAGE AND CONNECTION INTO EX. LINES. ALL INVERT ELEVATIONS SHALL BE SET PRIOR TO INSTALLATION.
2. THE PLUMBING CONTRACTOR SHALL PROVIDE ALL ITEMS, ARTICLES AND MATERIALS AS REQUIRED, INCLUDING ALL LABOR AND INCIDENTALS NECESSARY FOR A COMPLETE PLUMBING INSTALLATION.
3. THE PLUMBING CONTRACTOR SHALL CLEAN ALL FIXTURES, POLISH ALL METAL PARTS, CHECK AND ADJUST ALL FITTINGS, FAUCETS AND VALVES. ALL OPERATING INSTRUCTIONS SHALL BE TURNED OVER TO THE GENERAL CONTRACTOR FOR PRESENTATION TO THE OWNER.
4. UNLESS OTHERWISE NOTED, ALL PIPING SHALL BE CONCEALED WITHIN THE BUILDING STRUCTURE. NATURAL GAS PIPING SHALL NOT BE ROUTED BELOWCONCRETE SLAB ON GRADE WITHIN BUILDING.
5. ALL PIPING PASSING THROUGH FIRE RATED OR FIRE AND SMOKE RATED ASSEMBLIES SHALL BE SLEEVED AND FIRESTOPPED. FIRESTOPPING SHALL COMPLY WITH U.L. LISTING AND REQUIREMENTS FOR ASSEMBLY TYPE BEING PENETRATED.
6. PLUMBING CONTRACTOR SHALL NOT CORE DRILL OR DISTURB ANY STRUCTURAL MEMBERS WITHOUT WRITTEN AUTHORIZATION BY THE ARCHITECT AND/OR STRUCTURAL ENGINEER.
7. PLUMBING CONTRACTOR SHALL COORDINATE PIPING LOCATIONS AND ROUTING WITH FIRE PROTECTION DUCTWORK AND ELECTRICAL CONDUIT INSTALLATIONS. PLUMBING CONTRACTOR SHALL REVIEW ARCHITECTURAL DRAWINGS TO ESTABLISH WHERE FURR-DOWNS AND SOFFITS OCCUR AND DIMENSIONS OF SAME SO THAT DISTANCES AND PIPING ROUTING CAN BE PROPERLY COORDINATED. ALL PIPING SHALL BE ROUTED IN A CONCEALED MANNER.
8. PLUMBING CONTRACTOR SHALL AVOID LOCATING HW/CW PIPING IN LOCATIONS WHERE POSSIBILITY OF FREEZING OF SAME EXISTS. CONTRACTOR SHALL ADVISE ENGINEER WHERE THIS CONDITION MAY OCCUR PRIOR TO ROUGH-IN.
9. ALL ADA ACCESSIBLE LAVATORIES AND SINKS WITH EXPOSED WATER AND DRAIN PIPES SHALL BE INSULATED TO PROTECT AGAINST CONTACT PER ADAREQUIREMENTS. THERE SHALL BE NO SHARP OR ABRASIVE SURFACES.
10. WHERE USED, THE TERM "PROVIDE" SHALL MEAN TO "FURNISH AND INSTALL"
11. ALL PLUMBING WORK SHALL BE INSTALLED IN COMPLIANCE WITH ALL STATE AND LOCAL CODES.
12. COORDINATE ROUTING OF ALL PIPING WITH THE ELECTRICAL CONTRACTOR SO AS NOT TO ROUTE ANY PLUMBING LINES OVER ELECTRICAL PANELS, SWITCHGEAR, ETC.
13. WHERE APPLICABLE, THE EXISTING CONDITIONS INDICATED ON THESE PLANS SHALL BE VERIFIED IN THE FIELD FOR EXACT LOCATIONS, QUANTITY, AND PIPE SIZES.

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
WILLIAM EPPS, JR.
PE-19127
PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION
BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

BELOW-SLAB FLOOR PLAN - PLUMBING

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	AME
CHECKED	JRE

REVISIONS

No.	Description	Date

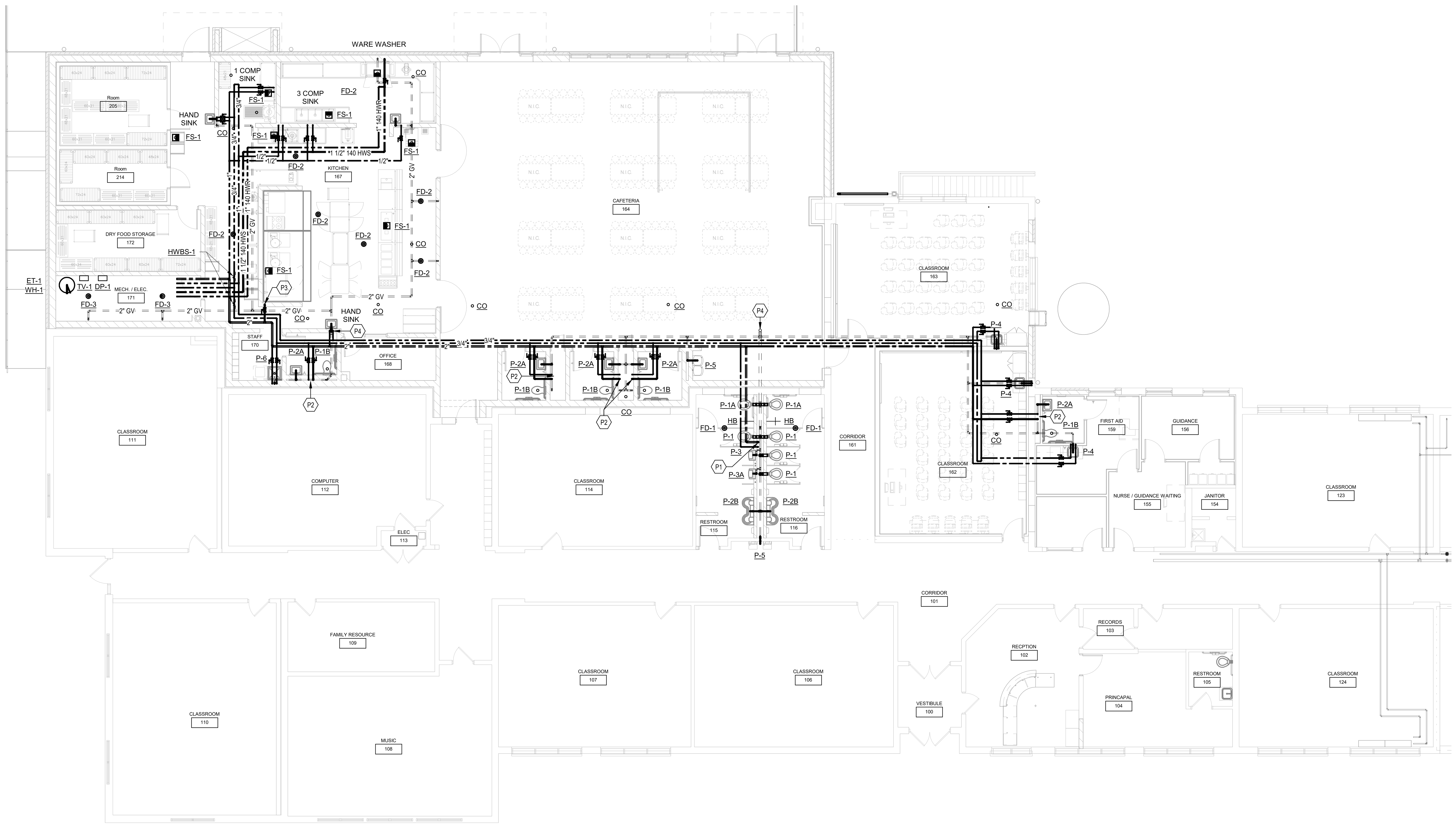
SHEET
P2.1

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:26 PM

GENERAL PLUMBING NOTES:

1. THE PLUMBING CONTRACTOR SHALL DETERMINE NECESSARY INVERT ELEVATIONS FOR PROPER DRAINAGE AND CONNECTION INTO EX. LINES. ALL INVERT ELEVATIONS SHALL BE SET PRIOR TO INSTALLATION.
2. THE PLUMBING CONTRACTOR SHALL PROVIDE ALL ITEMS, ARTICLES AND MATERIALS AS REQUIRED, INCLUDING ALL LABOR AND INCIDENTALS NECESSARY FOR A COMPLETE PLUMBING INSTALLATION.
3. THE PLUMBING CONTRACTOR SHALL CLEAN ALL FIXTURES, POLISH ALL METAL PARTS, CHECK AND ADJUST ALL FITTINGS, FAUCETS AND VALVES. ALL OPERATING INSTRUCTIONS SHALL BE TURNED OVER TO THE GENERAL CONTRACTOR FOR PRESENTATION TO THE OWNER.
4. UNLESS OTHERWISE NOTED, ALL PIPING SHALL BE CONCEALED WITHIN THE BUILDING STRUCTURE. NATURAL GAS PIPING SHALL NOT BE ROUTED BELOWCONCRETE SLAB ON GRADE WITHIN BUILDING.
5. ALL PIPING PASSING THROUGH FIRE RATED OR FIRE AND SMOKE RATED ASSEMBLIES SHALL BE SLEEVED AND FIRESTOPPED. FIRESTOPPING SHALL COMPLY WITH U.L. LISTING AND REQUIREMENTS FOR ASSEMBLY TYPE BEING PENETRATED.
6. PLUMBING CONTRACTOR SHALL NOT CORE DRILL OR DISTURB ANY STRUCTURAL MEMBERS WITHOUT WRITTEN AUTHORIZATION BY THE ARCHITECT AND/OR STRUCTURAL ENGINEER.
7. PLUMBING CONTRACTOR SHALL COORDINATE PIPING LOCATIONS AND ROUTING WITH FIRE PROTECTION DUCTWORK AND ELECTRICAL CONDUIT INSTALLATIONS. PLUMBING CONTRACTOR SHALL REVIEW ARCHITECTURAL DRAWINGS TO ESTABLISH WHERE FURR-DOWNS AND SOFFITS OCCUR AND DIMENSIONS OF SAME SO THAT DISTANCES AND PIPING ROUTING CAN BE PROPERLY COORDINATED. ALL PIPING SHALL BE ROUTED IN A CONCEALED MANNER.
8. PLUMBING CONTRACTOR SHALL AVOID LOCATING HW/CW PIPING IN LOCATIONS WHERE POSSIBILITY OF FREEZING OF SAME EXISTS. CONTRACTOR SHALL ADVISE ENGINEER WHERE THIS CONDITION MAY OCCUR PRIOR TO ROUGH-IN.
9. ALL ADA ACCESSIBLE LAVATORIES AND SINKS WITH EXPOSED WATER AND DRAIN PIPES SHALL BE INSULATED TO PROTECT AGAINST CONTACT PER ADAREQUIREMENTS. THERE SHALL BE NO SHARP OR ABRASIVE SURFACES.
10. WHERE USED, THE TERM "PROVIDE" SHALL MEAN TO "FURNISH AND INSTALL"
11. ALL PLUMBING WORK SHALL BE INSTALLED IN COMPLIANCE WITH ALL STATE AND LOCAL CODES.
12. COORDINATE ROUTING OF ALL PIPING WITH THE ELECTRICAL CONTRACTOR SO AS NOT TO ROUTE ANY PLUMBING LINES OVER ELECTRICAL PANELS, SWITCHGEAR, ETC.
13. WHERE APPLICABLE, THE EXISTING CONDITIONS INDICATED ON THESE PLANS SHALL BE VERIFIED IN THE FIELD FOR EXACT LOCATIONS, QUANTITY, AND PIPE SIZES.

TAGGED NOTES	
P1	2" CW AND 3/4" HW DN IN CHASE. EXTEND TO FIXTURES AND CONNECT. PROVIDE WATER HAMMER ARRESTORS AS SPECIFIED.
P2	1-1/2" CW, 1/2" HW DN IN CHASE TO FIXTURES. PROVIDE WATER HAMMER ARRESTORS AS SPECIFIED.
P3	1-1/2" CW DN 2'-0" A.F.F. AND ROUTE TO KITCHEN EQUIPMENT.
P4	4" VTR



1 FIRST FLOOR PLAN - PLUMBING

SCALE: 1/8" = 1'-0"

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY WILLIAM EPPS, JR. PE-19127 PROFESSIONAL ENGINEER

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277

HART COUNTY BOARD OF EDUCATION

HORSE CAVE, KY

FIRST FLOOR PLAN - PLUMBING

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	AME
CHECKED	JRE

REVISIONS

No.	Description	Date

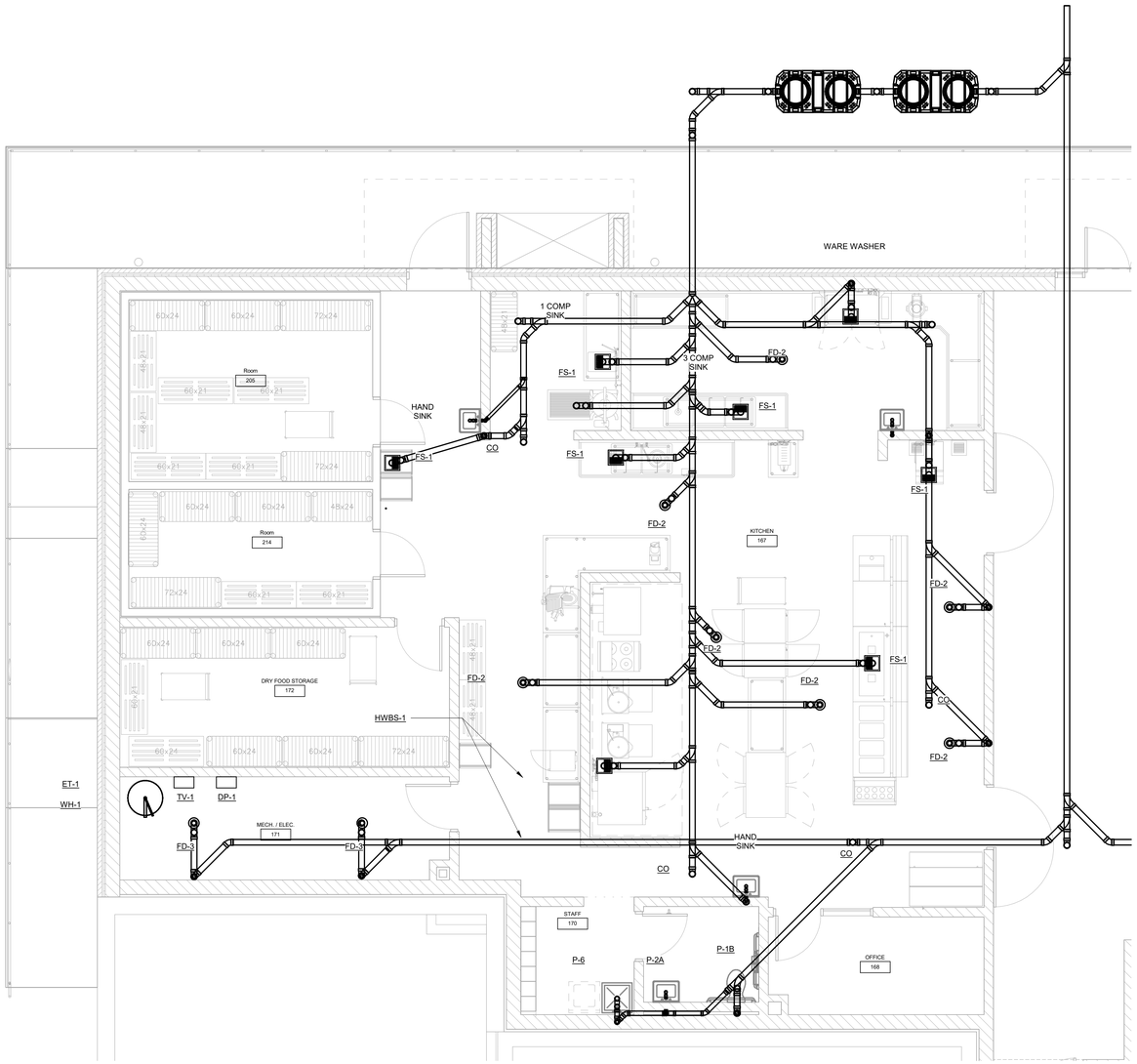
SHEET

P2.2

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:27 PM

GENERAL PLUMBING NOTES:

1. THE PLUMBING CONTRACTOR SHALL DETERMINE NECESSARY INVERT ELEVATIONS FOR PROPER DRAINAGE AND CONNECTION INTO EX. LINES. ALL INVERT ELEVATIONS SHALL BE SET PRIOR TO INSTALLATION.
2. THE PLUMBING CONTRACTOR SHALL PROVIDE ALL ITEMS, ARTICLES AND MATERIALS AS REQUIRED, INCLUDING ALL LABOR AND INCIDENTALS NECESSARY FOR A COMPLETE PLUMBING INSTALLATION.
3. THE PLUMBING CONTRACTOR SHALL CLEAN ALL FIXTURES, POLISH ALL METAL PARTS, CHECK AND ADJUST ALL FITTINGS, FAUCETS AND VALVES. ALL OPERATING INSTRUCTIONS SHALL BE TURNED OVER TO THE GENERAL CONTRACTOR FOR PRESENTATION TO THE OWNER.
4. UNLESS OTHERWISE NOTED, ALL PIPING SHALL BE CONCEALED WITHIN THE BUILDING STRUCTURE. NATURAL GAS PIPING SHALL NOT BE ROUTED BELOWCONCRETE SLAB ON GRADE WITHIN BUILDING.
5. ALL PIPING PASSING THROUGH FIRE RATED OR FIRE AND SMOKE RATED ASSEMBLIES SHALL BE SLEEVED AND FIRESTOPPED. FIRESTOPPING SHALL COMPLY WITH U.L. LISTING AND REQUIREMENTS FOR ASSEMBLY TYPE BEING PENETRATED.
6. PLUMBING CONTRACTOR SHALL NOT CORE DRILL OR DISTURB ANY STRUCTURAL MEMBERS WITHOUT WRITTEN AUTHORIZATION BY THE ARCHITECT AND/OR STRUCTURAL ENGINEER.
7. PLUMBING CONTRACTOR SHALL COORDINATE PIPING LOCATIONS AND ROUTING WITH FIRE PROTECTION DUCTWORK AND ELECTRICAL CONDUIT INSTALLATIONS. PLUMBING CONTRACTOR SHALL REVIEW ARCHITECTURAL DRAWINGS TO ESTABLISH WHERE FURR-DOWNS AND SOFFITS OCCUR AND DIMENSIONS OF SAME SO THAT DISTANCES AND PIPING ROUTING CAN BE PROPERLY COORDINATED. ALL PIPING SHALL BE ROUTED IN A CONCEALED MANNER.
8. PLUMBING CONTRACTOR SHALL AVOID LOCATING HW/CW PIPING IN LOCATIONS WHERE POSSIBILITY OF FREEZING OF SAME EXISTS. CONTRACTOR SHALL ADVISE ENGINEER WHERE THIS CONDITION MAY OCCUR PRIOR TO ROUGH-IN.
9. ALL ADA ACCESSIBLE LAVATORIES AND SINKS WITH EXPOSED WATER AND DRAIN PIPES SHALL BE INSULATED TO PROTECT AGAINST CONTACT PER ADAREQUIREMENTS. THERE SHALL BE NO SHARP OR ABRASIVE SURFACES.
10. WHERE USED, THE TERM "PROVIDE" SHALL MEAN TO "FURNISH AND INSTALL"
11. ALL PLUMBING WORK SHALL BE INSTALLED IN COMPLIANCE WITH ALL STATE AND LOCAL CODES.
12. COORDINATE ROUTING OF ALL PIPING WITH THE ELECTRICAL CONTRACTOR SO AS NOT TO ROUTE ANY PLUMBING LINES OVER ELECTRICAL PANELS, SWITCHGEAR, ETC.
13. WHERE APPLICABLE, THE EXISTING CONDITIONS INDICATED ON THESE PLANS SHALL BE VERIFIED IN THE FIELD FOR EXACT LOCATIONS, QUANTITY, AND PIPE SIZES.



1 ENLARGED KITCHEN PLAN - BELOW SLAB PLUMBING

NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

COMMONWEALTH OF KENTUCKY
WILLIAM EPPS, JR.
PE-19127
LICENSED PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company
1001 Wilkinson Blvd. | Frankfort, KY 40601 | 502.695.1178

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ENLARGED KITCHEN PLAN – BELOW SLAB PLUMBING

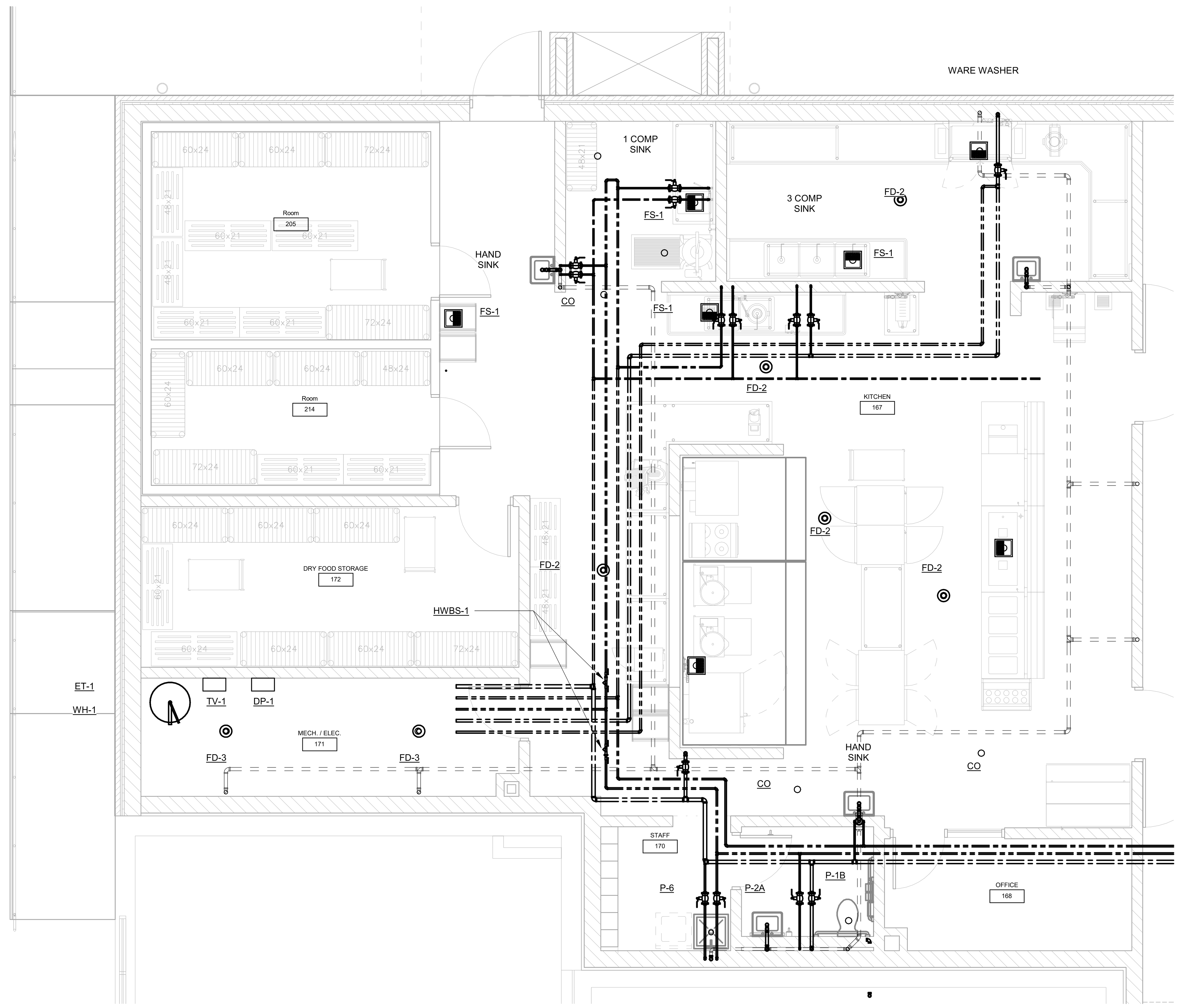
JOB NO.	1506.2
DATE	08/03/2023
DRAWN	AME
CHECKED	JRE

REVISIONS

No.	Description	Date

SHEET

P3.1



1 ENLARGED KITCHEN PLAN - PLUMBING

NO SCALE

GENERAL PLUMBING NOTES:

1. THE PLUMBING CONTRACTOR SHALL DETERMINE NECESSARY INVERT ELEVATIONS FOR PROPER DRAINAGE AND CONNECTION INTO EX. LINES. ALL INVERT ELEVATIONS SHALL BE SET PRIOR TO INSTALLATION.
2. THE PLUMBING CONTRACTOR SHALL PROVIDE ALL ITEMS, ARTICLES AND MATERIALS AS REQUIRED, INCLUDING ALL LABOR AND INCIDENTALS NECESSARY FOR A COMPLETE PLUMBING INSTALLATION.
3. THE PLUMBING CONTRACTOR SHALL CLEAN ALL FIXTURES, POLISH ALL METAL PARTS, CHECK AND ADJUST ALL FITTINGS, FAUCETS AND VALVES. ALL OPERATING INSTRUCTIONS SHALL BE TURNED OVER TO THE GENERAL CONTRACTOR FOR PRESENTATION TO THE OWNER.
4. UNLESS OTHERWISE NOTED, ALL PIPING SHALL BE CONCEALED WITHIN THE BUILDING STRUCTURE. NATURAL GAS PIPING SHALL NOT BE ROUTED BELOWCONCRETE SLAB ON GRADE WITHIN BUILDING.
5. ALL PIPING PASSING THROUGH FIRE RATED OR FIRE AND SMOKE RATED ASSEMBLIES SHALL BE SLEEVED AND FIRESTOPPED. FIRESTOPPING SHALL COMPLY WITH U.L. LISTING AND REQUIREMENTS FOR ASSEMBLY TYPE BEING PENETRATED.
6. PLUMBING CONTRACTOR SHALL NOT CORE DRILL OR DISTURB ANY STRUCTURAL MEMBERS WITHOUT WRITTEN AUTHORIZATION BY THE ARCHITECT AND/OR STRUCTURAL ENGINEER.
7. PLUMBING CONTRACTOR SHALL COORDINATE PIPING LOCATIONS AND ROUTING WITH FIRE PROTECTION DUCTWORK AND ELECTRICAL CONDUIT INSTALLATIONS. PLUMBING CONTRACTOR SHALL REVIEW ARCHITECTURAL DRAWINGS TO ESTABLISH WHERE FURR-DOWNS AND SOFFITS OCCUR AND DIMENSIONS OF SAME SO THAT DISTANCES AND PIPING ROUTING CAN BE PROPERLY COORDINATED. ALL PIPING SHALL BE ROUTED IN A CONCEALED MANNER.
8. PLUMBING CONTRACTOR SHALL AVOID LOCATING HW/CW PIPING IN LOCATIONS WHERE POSSIBILITY OF FREEZING OF SAME EXISTS. CONTRACTOR SHALL ADVISE ENGINEER WHERE THIS CONDITION MAY OCCUR PRIOR TO ROUGH-IN.
9. ALL ADA ACCESSIBLE LAVATORIES AND SINKS WITH EXPOSED WATER AND DRAIN PIPES SHALL BE INSULATED TO PROTECT AGAINST CONTACT PER ADAREQUIREMENTS. THERE SHALL BE NO SHARP OR ABRASIVE SURFACES.
10. WHERE USED, THE TERM "PROVIDE" SHALL MEAN TO "FURNISH AND INSTALL"
11. ALL PLUMBING WORK SHALL BE INSTALLED IN COMPLIANCE WITH ALL STATE AND LOCAL CODES.
12. COORDINATE ROUTING OF ALL PIPING WITH THE ELECTRICAL CONTRACTOR SO AS NOT TO ROUTE ANY PLUMBING LINES OVER ELECTRICAL PANELS, SWITCHGEAR, ETC.
13. WHERE APPLICABLE, THE EXISTING CONDITIONS INDICATED ON THESE PLANS SHALL BE VERIFIED IN THE FIELD FOR EXACT LOCATIONS, QUANTITY, AND PIPE SIZES.

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY WILLIAM EPPS, JR. PE-19127 PROFESSIONAL ENGINEER

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ENLARGED KITCHEN PLAN – PLUMBING

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	AME
CHECKED	JRE

REVISIONS

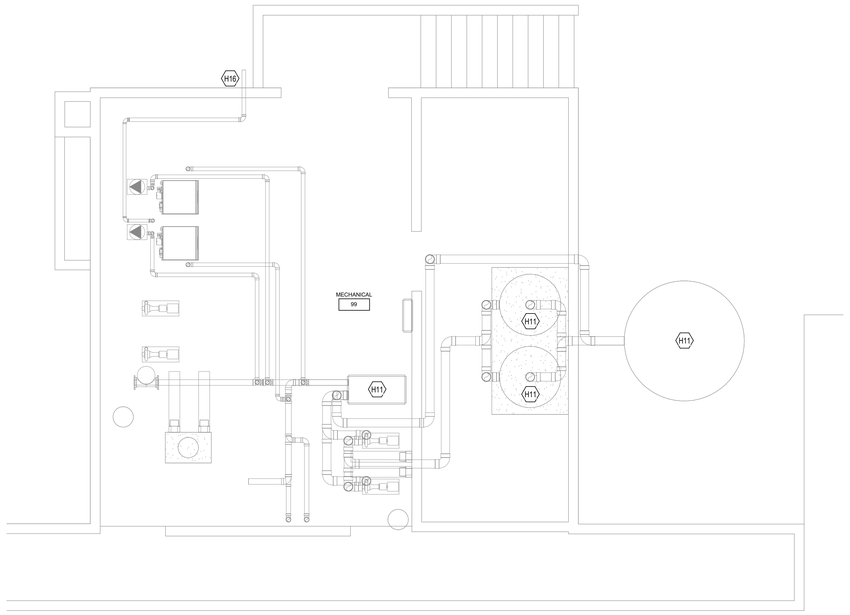
No.	Description	Date

SHEET

P3.2

GENERAL PLUMBING NOTES:

1. THE PLUMBING CONTRACTOR SHALL DETERMINE NECESSARY INVERT ELEVATIONS FOR PROPER DRAINAGE AND CONNECTION INTO EX. LINES. ALL INVERT ELEVATIONS SHALL BE SET PRIOR TO INSTALLATION.
2. THE PLUMBING CONTRACTOR SHALL PROVIDE ALL ITEMS, ARTICLES AND MATERIALS AS REQUIRED, INCLUDING ALL LABOR AND INCIDENTALS NECESSARY FOR A COMPLETE PLUMBING INSTALLATION.
3. THE PLUMBING CONTRACTOR SHALL CLEAN ALL FIXTURES, POLISH ALL METAL PARTS, CHECK AND ADJUST ALL FITTINGS, FAUCETS AND VALVES. ALL OPERATING INSTRUCTIONS SHALL BE TURNED OVER TO THE GENERAL CONTRACTOR FOR PRESENTATION TO THE OWNER.
4. UNLESS OTHERWISE NOTED, ALL PIPING SHALL BE CONCEALED WITHIN THE BUILDING STRUCTURE. NATURAL GAS PIPING SHALL NOT BE ROUTED BELOWCONCRETE SLAB ON GRADE WITHIN BUILDING.
5. ALL PIPING PASSING THROUGH FIRE RATED OR FIRE AND SMOKE RATED ASSEMBLIES SHALL BE SLEEVED AND FIRESTOPPED. FIRESTOPPING SHALL COMPLY WITH U.L. LISTING AND REQUIREMENTS FOR ASSEMBLY TYPE BEING PENETRATED.
6. PLUMBING CONTRACTOR SHALL NOT CORE DRILL OR DISTURB ANY STRUCTURAL MEMBERS WITHOUT WRITTEN AUTHORIZATION BY THE ARCHITECT AND/OR STRUCTURAL ENGINEER.
7. PLUMBING CONTRACTOR SHALL COORDINATE PIPING LOCATIONS AND ROUTING WITH FIRE PROTECTION DUCTWORK AND ELECTRICAL CONDUIT INSTALLATIONS. PLUMBING CONTRACTOR SHALL REVIEW ARCHITECTURAL DRAWINGS TO ESTABLISH WHERE FURR-DOWNS AND SOFFITS OCCUR AND DIMENSIONS OF SAME SO THAT DISTANCES AND PIPING ROUTING CAN BE PROPERLY COORDINATED. ALL PIPING SHALL BE ROUTED IN A CONCEALED MANNER.
8. PLUMBING CONTRACTOR SHALL AVOID LOCATING HW/CW PIPING IN LOCATIONS WHERE POSSIBILITY OF FREEZING OF SAME EXISTS. CONTRACTOR SHALL ADVISE ENGINEER WHERE THIS CONDITION MAY OCCUR PRIOR TO ROUGH-IN.
9. ALL ADA ACCESSIBLE LAVATORIES AND SINKS WITH EXPOSED WATER AND DRAIN PIPES SHALL BE INSULATED TO PROTECT AGAINST CONTACT PER ADAREQUIREMENTS. THERE SHALL BE NO SHARP OR ABRASIVE SURFACES.
10. WHERE USED, THE TERM "PROVIDE" SHALL MEAN TO "FURNISH AND INSTALL"
11. ALL PLUMBING WORK SHALL BE INSTALLED IN COMPLIANCE WITH ALL STATE AND LOCAL CODES.
12. COORDINATE ROUTING OF ALL PIPING WITH THE ELECTRICAL CONTRACTOR SO AS NOT TO ROUTE ANY PLUMBING LINES OVER ELECTRICAL PANELS, SWITCHGEAR, ETC.
13. WHERE APPLICABLE, THE EXISTING CONDITIONS INDICATED ON THESE PLANS SHALL BE VERIFIED IN THE FIELD FOR EXACT LOCATIONS, QUANTITY, AND PIPE SIZES.



1 ENLARGED BASEMENT PLAN - PLUMBING
NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

COMMONWEALTH OF KENTUCKY
WILLIAM EPPS, JR.
PE-19127
STATE
REGISTERED
PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company
1001 Wilkinson Blvd. | Frankfort, KY 40601 | 502.695.1178

LEGRANDE ELEMENTARY ADDITION AND RENOVATION
BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

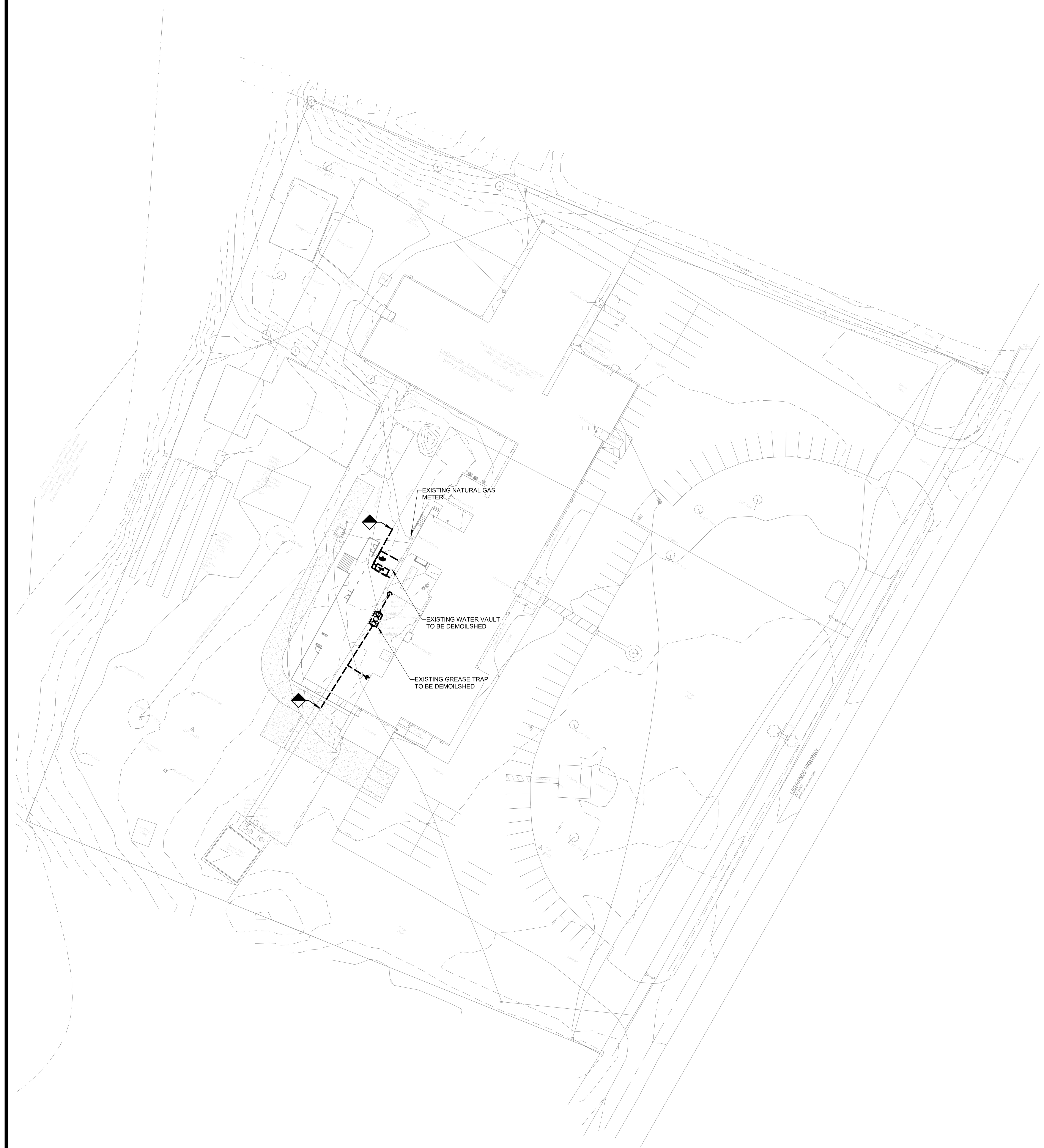
ENLARGED MECHANICAL ROOM PLAN – PLUMBING

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	AME
CHECKED	JRE

REVISIONS

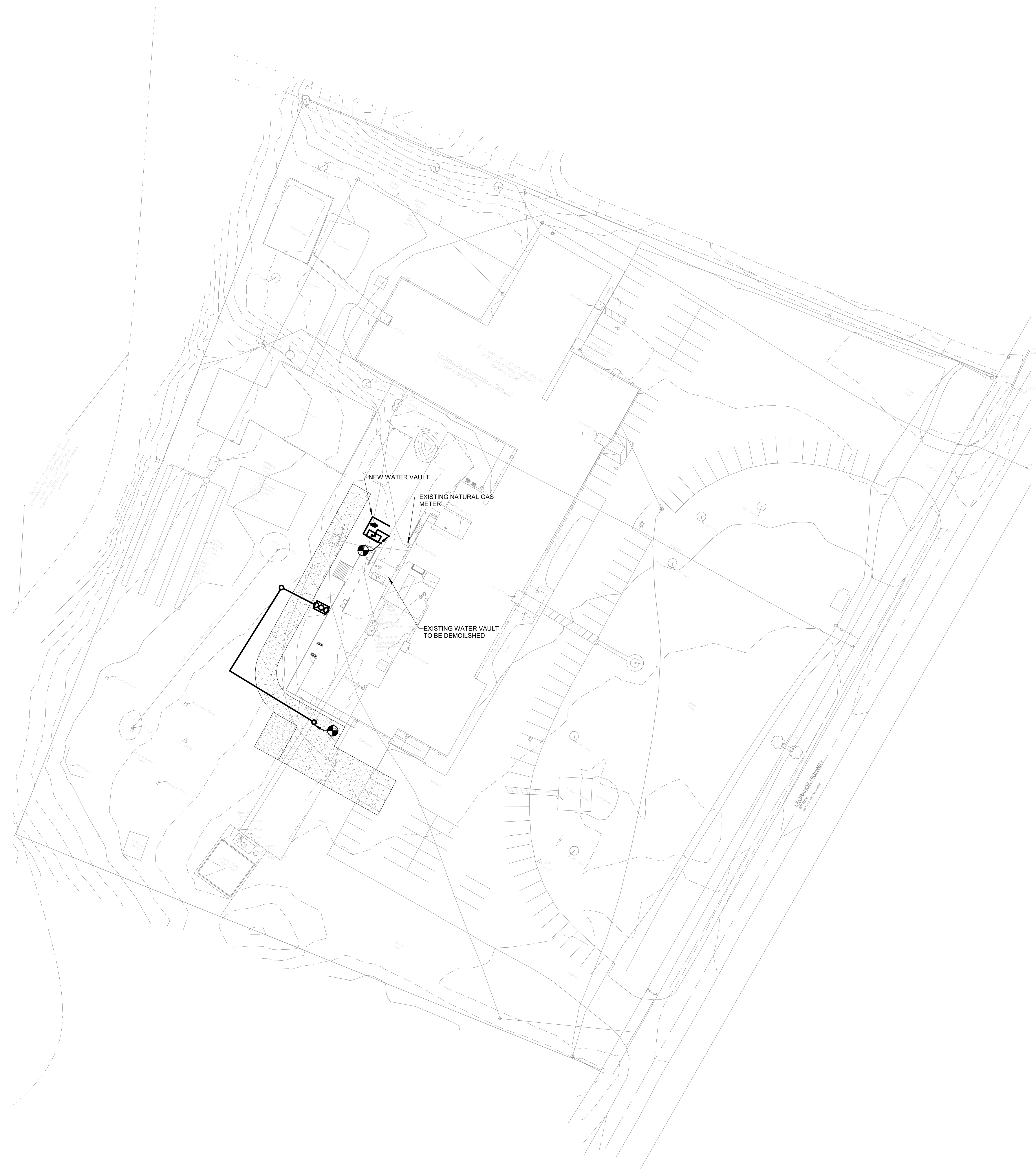
No.	Description	Date

SHEET
P3.3



1 SITE UTILITY PLAN – PLUMBING DEMOLITION

SCALE: 1" = 40'-0"



2 SITE UTILITY PLAN – PLUMBING

NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY WILLIAM EPPS, JR. PE-19127 PROFESSIONAL ENGINEER

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

SITE UTILITY PLAN – PLUMBING

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	AME
CHECKED	JRE

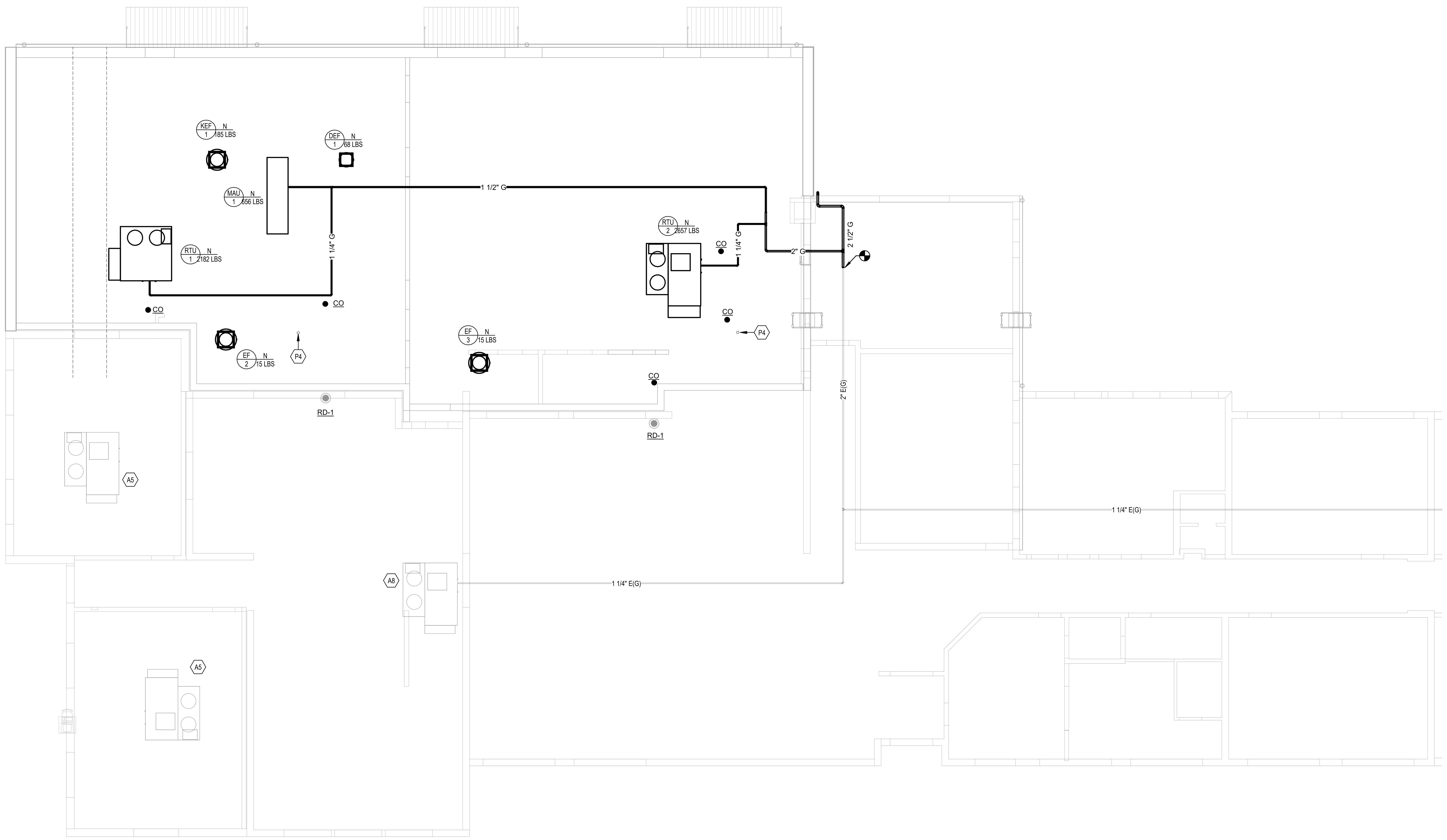
REVISIONS

No.	Description	Date

SHEET

P4.1

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:29 PM



1 ROOF PLAN - PLUMBING - OVERALL

NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
WILLIAM EPPS, JR.
PE-19127
PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ROOF PLAN PLUMBING

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	AME
CHECKED	JRE

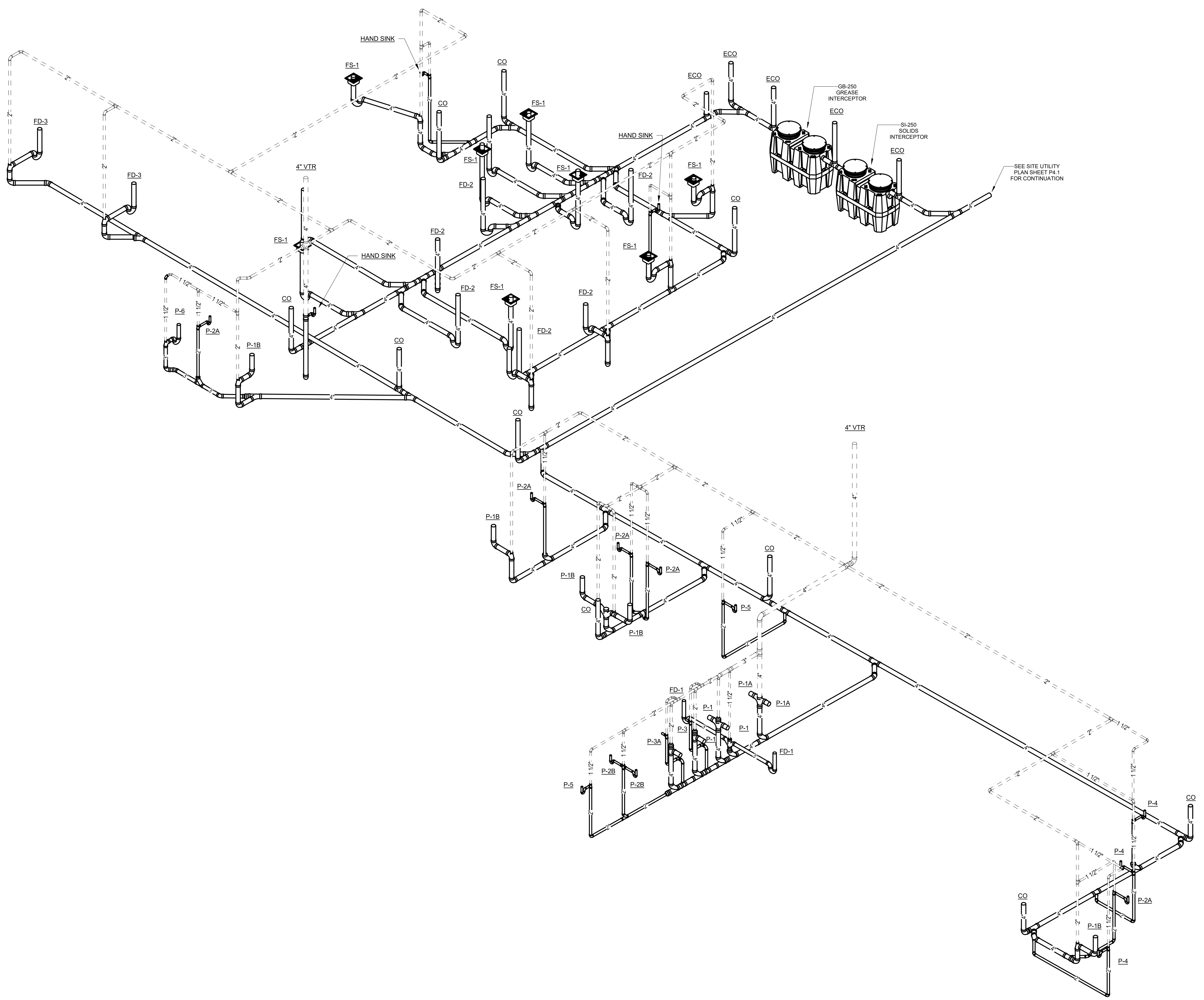
REVISIONS

No.	Description	Date

SHEET

P4.2

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:30 PM



1 WASTE AND VENT RISER DIAGRAM

NO SCALE

STATE OF KENTUCKY
WILLIAM EPPS, JR.
PE-19127
PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

WASTE AND VENT RISER DIAGRAM

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	AME
CHECKED	JRE

REVISIONS

No.	Description	Date

SHEET

P5.1

MECHANICAL GENERAL NOTES

A COORDINATE THE LOCATION OF DRAINS, THERMOSTATS, GAS OUTLETS, ETC., WITH ALL CASEWORK EQUIPMENT, MECHANICAL ROOM EQUIPMENT, ETC., PRIOR TO COMMENCING INSTALLATION. WORK NOT SO COORDINATED SHALL BE REMOVED AND PROPERLY INSTALLED AT THE EXPENSE OF THE CONTRACTOR.

B THE CONTRACTOR SHALL EXERCISE EXTREME CARE IN THE COURSE OF THEIR WORK SO AS TO INSURE THAT THEY DO NOT INTERRUPT ANY EXISTING SERVICE. FOR SAFETY PURPOSES, PAY PARTICULAR ATTENTION TO THIS PRECAUTION RELATIVE TO NATURAL GAS AND ELECTRICAL LINES. VERIFY THE LOCATION, SIZE, TYPE, ETC., OF EACH UNDERGROUND OR OVERHEAD UTILITY. ALL WORK SHALL BE PERFORMED IN ACCORD WITH ALL FEDERAL, STATE AND/OR LOCAL RULES, REGULATIONS, STANDARD AND SAFETY REQUIREMENTS. UTILITIES SHALL BE INSTALLED IN ACCORD WITH THE APPLICABLE MUNICIPALITY OR UTILITY COMPANY STANDARDS. IN ALL CASES, THE MOST STRINGENT REQUIREMENT SHALL APPLY.

C WHERE WORK IS REQUIRED ABOVE EXISTING LAY-IN, PLASTER OR GYPSUM BOARD CEILINGS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL AND REINSTALLATION (OR REPLACEMENT, IF DAMAGED) OF ALL CEILING OR TILE AND GRID MEMBERS NECESSARY TO PERFORM HIS WORK. NEW TILE AND GRID SHALL MATCH THE SURROUNDING AREAS. ALL PATCHING WORK SHALL MATCH ADJACENT SURFACES.

D ALL NEW WORK SHALL BE HUNG FROM STRUCTURE, NOT FROM THE WORK OF OTHER TRADES, WHETHER EXISTING OR NEW.

E COORDINATE ALL WORK WITH PROJECT PHASING REQUIREMENTS.

F PATCH, REPAIR AND PAINT OR PROVIDE WALL COVERING FOR (TO OWNER'S STANDARDS) EXISTING WALLS, CEILINGS, ETC., THAT ARE TO REMAIN IF DAMAGED DURING CONSTRUCTION. REPAIRS SHALL MATCH ADJACENT SURFACES TO THE SATISFACTION OF THE ARCHITECT AND OWNER.

G OBSERVE ALL APPLICABLE CODES, RULES AND REGULATIONS THAT MAY APPLY TO THE WORK UNDER THIS CONTRACT. (CITY, COUNTY, LOCAL, FEDERAL, MUNICIPALITY, UTILITY COMPANY, COMMONWEALTH OF KENTUCKY, ETC.)

H CONTRACTOR SHALL BE AWARE OF UNSEEN PLUMBING, HVAC AND ELECTRICAL WORK DURING DEMOLITION. IF ITEMS ARE UNCOVERED DURING DEMOLITION THEN FIELD VERIFY THE USE OF THE ITEMS AND PLAN AN ALTERNATE ROUTE TO RUN THESE ITEMS. THEN CONTACT THE ENGINEERS TO REVIEW THE ROUTING.

I IF AREA OF CONSTRUCTION HAS A POST TENSION FLOOR SLAB. CONTRACTOR SHALL USE ULTRA SOUND OR OTHER APPROVED METHODS TO SURVEY THE EXISTING FLOOR STRUCTURE BEFORE MAKING ANY AND ALL FLOOR PENETRATIONS.

J WHERE FIRE PROOFING IS SPRAYED ON EXISTING STRUCTURE ALL EXISTING CONDUITS, WATER, HYDRONIC, STEAM, CHILLED WATER, FIRE PROTECTION LINES, MED GAS, ETC. SHALL BE LOWERED TO BE BELOW FULL THICKNESS OF FIRE PROOFING WITH NO INTERFERENCE.

K ALL PENETRATIONS OF FIRE AND SMOKE RATED ASSEMBLIES SHALL BE APPROPRIATELY FIRE STOPPED PER AN APPROVED U.L. LISTED STANDARD. CONTRACTOR SHALL PAY PARTICULAR ATTENTION TO INSULATED PIPING PENETRATIONS.

L ALL WORK REQUIRING DOWNTIME OF ANY AREA IN THE BUILDING SHALL BE SCHEDULED 2 WEEKS IN ADVANCE, AND SHALL COMPLY WITH INTERIM LIFE SAFETY MEASURES.

M ALL DUCTWORK, PIPING, CONDUITS, ETC. IN ROOMS WITH CEILINGS SHALL BE ABOVE CEILING EXCEPT AS NOTED.

N INSTALL AIR VENTS AT HIGH POINTS IN PIPING AND DRAINS IN LOW POINTS. USE CARE TO AVOID FREEZING OF EXTERIOR VENTS.

O LOCATIONS OF PIPING, DUCTS AND EQUIPMENT ARE APPROXIMATE AND SUBJECT TO MINOR ADJUSTMENTS IN THE FIELD. DO NOT SCALE THE DRAWINGS.

P ALL OFFSETS IN DUCTS AND PIPING ARE NOT NECESSARILY SHOWN. PROVIDE ADDITIONAL OFFSETS WHERE NECESSARY.

Q COORDINATE ALL HVAC WORK WITH ELECTRICAL, PLUMBING AND OTHER TRADES TO AVOID INTERFERENCE WITH PIPING, DUCTS, CONDUIT AND OTHER EQUIPMENT.

R INSTALL ALL PIPING, DUCTWORK AND EQUIPMENT IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTION. IF IN CONFLICT WITH THE DESIGN INDICATED IN CONTRACT DOCUMENTS, ADVISE THE ENGINEERS PRIOR TO INSTALLATION FOR CLARIFICATION. PROVIDE RECOMMENDED ACCESS AND SERVICE CLEARANCES FOR ALL EQUIPMENT.

S SEAL AIRTIGHT AROUND ALL DUCTS AND PIPING PENETRATIONS THROUGH WALLS, FLOORS AND ROOF. PROVIDE FIRE STOPPING IN FIRE PARTITION.

T SEAL ALL NEW DUCTWORK JOINTS WITH UNITED MCGILL, IRONGRIP 6O1 OR EQUAL WATER BASED SEALANT.

U ALL MOTOR DRIVEN EQUIPMENT SHALL BE INSTALLED WITH FLEXIBLE CONNECTIONS TO DUCTWORK, PIPING, ETC., UNLESS OTHERWISE NOTED.

V THE CONTRACTOR SHALL RELOCATE OR AVOID ANY EXISTING EQUIPMENT APPURTENANCES, ETC., THAT CONFLICT WITH NEW WORK.

W WHERE MOUNTING HEIGHTS ARE NOT INDICATED OR ARE IN CONFLICT WITH ANY OTHER BUILDING SYSTEM, CONTACT THE ENGINEERS BEFORE INSTALLATION. REFER ALSO TO ARCHITECTURAL WALL INTERIOR AND EXTERIOR WALL ELEVATIONS, CEILING HEIGHTS AND OTHER DETAIL OF THESE DOCUMENTS.

X DOUBLE WIDTH TURNING VANES SHALL BE INSTALLED IN ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK ELBOWS. TURNING VANES NOT REQUIRED FOR KITCHEN EXHAUSTS.

Y ANY VIBRATING, OSCILLATING OR OTHER NOISE OR MOTION PRODUCING EQUIPMENT SHALL BE ISOLATED FROM SURROUNDING SYSTEMS IN AN APPROVED MANNER. NOISY OR STRUCTURALLY DAMAGING INSTALLATIONS SHALL BE SATISFACTORILY REPLACED OR REPAIRED AT THE INSTALLING CONTRACTOR'S EXPENSE. THE FINAL DECISION ON THE SUITABILITY OF A PARTICULAR INSTALLATION'S ACCEPTABILITY SHALL BE THAT OF THE ENGINEER.

Z DEVIATIONS IN SIZE, CAPACITIES, FIT, FINISH, ETC. FOR EQUIPMENT FROM THAT USED AS BASIS OF DESIGN SHALL BE THE RESPONSIBILITY OF THE PURCHASER OF THAT EQUIPMENT. ANY PROVISIONS REQUIRED TO ACCOMMODATE A DEVIATION, WHETHER APPROVED BY THE ENGINEERS OR NOT, SHALL BE THE RESPONSIBILITY OF THE PURCHASER.

AA VALVES, BALANCING DAMPERS OR ANY MECHANICAL/ELECTRICAL ITEM REQUIRING ACCESS SHALL NOT BE LOCATED ABOVE A HARD CEILING. IF THIS IS NOT POSSIBLE, THEN AN APPROPRIATELY SIZED ACCESS DOOR SHALL BE PLACED UNDER THE ITEM TO ALLOW EASY MAINTENANCE AND ADJUSTMENT. ADDITIONALLY ALL SUCH ITEMS SHALL NOT BE LOCATED AN UNREASONABLE DISTANCE ABOVE THE CEILINGS. IN GENERAL ALL SUCH ITEMS UNLESS INDICATED OTHERWISE SHALL BE MOUNTED SIX TO TWELVE INCHES ABOVE THE CEILING. IF IN DOUBT, CONTACT ENGINEER PRIOR TO INSTALLING.

AB ALL MANHOLES, VAULTS AND SIMILAR UNDERGROUND STRUCTURES SHALL HAVE THE TOP ELEVATION SET FLUSH WITH FINISHED GRADE UNLESS SPECIFICALLY NOTED OTHERWISE.

AC WHEN RUNNING ANY TYPE OF PIPING BELOW A FOOTER, OR IN THE ZONE OF INFLUENCE THE PIPING SHALL BE BACKFILLED WITH CEMENTITIOUS FLOWABLE FILL PER SPECIFICATIONS. WHENEVER POSSIBLE, LOCATE PIPING OUTSIDE OF THE ZONE OF INFLUENCE. THE ZONE OF INFLUENCE IS THE AREA UNDER THE FOOTER WITHIN A 45 DEGREE ANGLE PROJECTING DOWN FROM THE BOTTOM EDGE OF THE FOOTER OF ALL SIDES OF THE FOOTER. ADDITIONALLY, GREASE TRAPS, MANHOLES, VAULTS AND OTHER UNDERGROUND STRUCTURES SHALL BE HELD AWAY FROM BUILDING WALLS FAR ENOUGH TO BE OUTSIDE OF THE ZONE OF INFLUENCE.

AD THE DOCUMENTS COMPLY WITH 2006 IMC, 2007 KBC, AND 2009 IECC.

AE THE DOCUMENTS COMPLY WITH 2006 IMC, 2007 KBC, AND ASHRAE 90.1-2007.

AF WORK IN CONFINED AREAS SHALL BE IN ACCORDANCE WITH THE OWNER'S SAFETY POLICY REQUIREMENTS.

AG THE CONTRACTOR SHALL INCLUDE IN THEIR BID ALL COSTS ASSOCIATED WITH DRAINING, STORAGE, DISPOSAL AND FILLING NEW PIPING SYSTEMS AS REQUIRED TO INSTALL THEIR NEW WORK. PIPING SYSTEMS INCLUDE:

1. DOMESTIC WATER
2. CONDESNER WATER

MECHANICAL DEMOLITION NOTES

A THE CONTRACTOR SHALL REFER TO THE ARCHITECTURAL PLANS FOR AREAS IN WHICH THE CEILING IS REMAINING. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING THE EXISTING CEILING AS REQUIRED AND REINSTALLATION. TEMPORARILY SUPPORT LIGHTS, DIFFUSERS, CEILING ETC. REPLACE BROKEN CEILING TILES WITH NEW AT NO ADDITIONAL COST TO OWNER. FIELED VERIFY EXACT REQUIREMENTS.

B DURING SPRINKLER SYSTEM OUTAGES THE CONTRACTORS SHALL PROVIDE FIRE WATCH OF AREAS WITH OUTAGES.

C ALL WALLS AND FLOOR SLABS SHALL BE REPAIRED TO MATCH EXISTING AND TO A LIKE NEW CONDITION. ALL RATED WALLS AND FLOOR SLABS SHALL BE PATCHED AND REPAIRED TO MAINTAIN RATING.

D ALL EXISTING BUILDING FINISHES SHALL BE PROTECTED DURING THE DEMOLITION PHASE.

E HEAVY DASHED LINES INDICATE ITEMS FOR REMOVAL (UON) AND LIGHT SOLID LINES INDICATE EXISTING ITEMS TO REMAIN.

F COORDINATE DISPOSAL OF ALL FIXTURES, DEVICES, ETC. (INDICATED FOR DEMOLITION) WITH THE OWNER.

G ALL OUTAGES SHALL BE SCHEDULED THROUGH THE UK CPMD PROJECT REPRESENTATIVE FOR PROPER COORDINATION. A REQUEST FOR AN OUTAGE SHALL BE SUBMITTED IN WRITING A MINIMUM OF TWO WEEKS IN ADVANCE.

H ALL DUCTWORK, PIPING, CONDUIT, ETC. SHALL BE INSTALLED A MINIMUM OF 4" ABOVE THE TOP OF THE CEILING GRID PER UK STANDARDS.

ABBREVIATIONS

AC	ALTERNATING CURRENT
ADJ	ADJUSTABLE
AFF	ABOVE FINISHED FLOOR
AFR	ABOVE FINISHED ROOF
AFUE	ANNUAL FUEL UTILIZATION EFFICIENCY
AHJ	AUTHORITY HAVING JURISDICTION
AMP	AMPERE (AMP, AMPS)
ANSI	AMERICAN NATIONAL STANDARD INSTITUTE
APD	AIR PRESSURE DROP
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATION, AND AIR-CONDITIONING ENGINEERS
ATU	AIR TERMINAL UNIT
AVG	AVERAGE
BAS	BUILDING AUTOMATION SYSTEM
BHP	BREAK HORSEPOWER
BTU	BRITISH THERMAL UNIT
CAP	CAPACITY
CAV	CONSTANT AIR VOLUME
CD	CONDENSATE DRAIN
CFM	CUBIC FEET PER MINUTE
C.I.	CAST IRON
CLG	CEILING
CLR	CLEAR
CO	CARBON MONOXIDE
CO2	CARBON DIOXIDE
COND	CONDENS (-ER, -ING, -ATION, -ATE)
CONT	CONTINU (-ED, -OUS)
CU FT	CUBIC FEET
CU IN	CUBIC INCHES
CV	VALVE FLOW COEFFICIENT
dB	DECIBEL
DB	DRY BULB
DBT	DRY BULB TEMPERATURE
DC	DIRECT CURRENT
DD	DUCT SMOKE DETECTOR
DDC	DIRECT DIGITAL CONTROLS
DEG	DEGREE (-S)
DIA	DIAMETER (-S)
DN	DOWN
DWG	DRAWING
EAT	ENTERING AIR TEMPERATURE
EC	ELECTRICAL CONTRACTOR
ELEV	ELEVA (-TION, -TOR)
ENGR	ENGINEER
EQ	EQUAL
ESP	EXTERNAL STATIC PRESSURE
ETR	EXISTING TO REMAIN
EVAP	EVAPORAT (-E, -ING, -ED, -OR, -ION)
EWT	ENTERING WATER TEMPERATURE
EXP	EXPANSION
EXT	EXTERIOR
FA	FREE AREA

ABBREVIATIONS (CONTINUED)

FD	FIRE DAMPER
FL	FLOOR
FLA	FULL LOAD AMPS
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FPC	FIRE PROTECTION CONTRACTOR
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FT	FEET **OR** FOOT
FUT	FUTURE
FV	FACE VELOCITY
GA	GAGE/GAUGE
GAL	GALLON (-S)
GC	GENERAL CONTRACTOR
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GR	GRAINS
H	HUMIDITY
HD	HEAD
HG	MERCURY
HORIZ	HORIZONTAL
HP	H (-ORSEPOWER, -EAT PUMP)
HR	HOUR (-S)
HVAC	HEATING, VENTILATING, & AIR-CONDITIONING
Hz	HERTZ
ID	I (-DENTIFICATION, -NSIDE DIAMETER, -NSIDE DIMENSION)
IN	INCH (-ES)
INSUL	INSULAT (-ED, -ION)
INT	INTER (-IOR, -ERVAL)
IPS	IRON PIPE SIZE
kW	KILOWATT
kWh	KILOWATT HOUR
LAT	LEAVING AIR TEMPERATURE
LBS	POUNDS
LF	LINEAR FEET/FOOT
LRA	LOCKED ROTOR AMPS
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MBH	BTU PER HOUR [THOUSANDS]
MCA	MINIMUM CIRCUIT AMPS
MFG	MANUFACTURER
MIN	MIN (-IMUM, -UTE)
MISC	MISCELLANEOUS
MOCP	MAXIMUM OVERCURRENT PROTECTION [AMPS]
MTG	MOUNTING
N/A	NOT APPLICABLE
NC	NOISE CRITERIA **OR** NORMALLY CLOSED
NEBB	NATIONAL ENVIRONMENTAL BALANCING BUREAU
NIC	NOT IN CONTRACT

ABBREVIATIONS (CONTINUED)

NO	NORMALLY OPEN **OR** NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DI (-AMETER, -MENSION)
CFCI	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
OR	OPEN RECEPTACLE
OZ	OUNCE (-S)
PC	PLUMBING CONTRACTOR
PD	PRESSURE DROP
PH	PHASE [ELECTRICAL]
PLBG	PLUMBING
PPM	PARTS PER MILLION
PRS	PRESSURE REDUCING STATION
PRV	PRESSURE REDUCING VALVE (STEAM, WATER, GAS)
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIG	PPSI GAUGE
RH	RELATIVE HUMIDITY [%]
RLA	RUNNING LOAD AMPS
RPM	REVOLUTIONS PER MINUTE
SD	SMOKE DAMPER
SP	STATIC PRESSURE
SQ	SQUARE
SQ FT	SQUARE FEET **OR** FOOT
SQ IN	SQUARE INCH **OR** INCHES
TAB	TESTING AND BALANCING
TBD	TO BE DETERMINED
TE	TOP ELEVATION
TEMP	TEMPERATURE
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
V	VOLT (-AGE, -S)
VAR	VARI (-ABLE, -IES)
VAV	VARIABLE AIR VOLUME
VEL	VELOCITY
VFD	VARIABLE FEQUENCY DRIVE
W	WATT (-AGE, -S)
WB	WET BULB
WBT	WET BULB TEMPERATURE
WPD	WATER PRESSURE DROP
WT	WEIGHT
W/	WITH
W/O	WITHOUT
%	PERCENT
ΔP	DIFFERENTIAL PRESSURE
ΔT	TEMPERATURE DIFFERENCE
℄	CENTERLINE

GENERAL SYMBOLS

#	TAGGED NOTE DESIGNATOR
X	REVISION TRIANGLE
ROOM NAME RM #	ROOM TAG
N/E TEXT2 MARK #	EQUIPMENT TAG
	POINT OF CONNECTION / CONNECT TO EXISTING
	POINT OF DEMOLITION

HVAC LEGEND

	SUPPLY AIR DIFFUSER
	RETURN AIR DIFFUSER
	EXHAUST AIR DIFFUSER
	TRANSFER AIR DIFFUSER W/ SOUND ATTENUATING BOOT
	SIDEWALL DIFFUSER/GRILLE
	SIDEWALL DIFFUSER/GRILLE
TAG AIRFLOW	AIR DEVICE TAG (REGISTER, GRILLE, DIFFUSER,LOUVER)
##x##	RECTANGULAR DUCT
#ø	ROUND/SPIRAL DUCT
##/##	FLAT OVAL DUCT
SA	SUPPLY AIR DUCT
RA	RETURN AIR DUCT
EA	EXHAUST AIR DUCT
OA	OUTSIDE AIR DUCT
TA	TRANSFER AIR DUCT
CAE	COMBUSTION AIR EXHAUST DUCT
CAI	COMBUSTION AIR INTAKE DUCT
SA	SA AIR DUCT TURNING UP
SA	SA AIR DUCT TURNING DOWN
RA	RA AIR DUCT TURNING UP
RA	RA AIR DUCT TURNING DOWN
EA	EA AIR DUCT TURNING UP
EA	EA AIR DUCT TURNING DOWN
E(XXX)	EXISTING DUCT - (XXX) DENOTES SYSTEM
D(XXX)	DUCT TO BE DEMOLISHED - (XXX) DENOTES SYSTEM
A(XXX)	DUCT TO BE ABANDONED IN PLACE - (XXX) DENOTES SYSTEM
	MITERED ELBOW WITH TURNING VANES
	FLEXIBLE DUCT
T	TEMPERATURE SENSOR WITH SETPOINT
Ts	TEMPERATURE SENSOR - STAINLESS STEEL PLATE
H	HUMIDITY SENSOR
Cs	CARBON DIOXIDE SENSOR
TC	TEMPERATURE & CARBON DIOXIDE SENSOR
VERT. HORIZ.	MANUAL BALANCING/VOLUME DAMPER
VERT. HORIZ.	MOTORIZED DAMPER
VERT. HORIZ.	FIRE DAMPER
VERT. HORIZ.	SMOKE DAMPER
VERT. HORIZ.	COMBINATION FIRE & SMOKE DAMPER
A/D	DUCT ACCESS DOOR

MECHANICAL PIPING LEGEND

	PIPE ELBOW TURNING UP
	PIPE ELBOW TURNING DOWN
	PIPE TEE; CONNECTION ON TOP
	PIPE TEE; CONNECTION ON BOTTOM
	PIPE CAP
—BFW—	BOILER FEEDWATER
—CAI/E—	COMBUSTION AIR INTAKE/EXHAUST
—CBS/R—	CHILLED BEAM SUPPLY/RETURN
—CD—	CONDENSATE DRAIN
—CHWS/R—	CHILLED WATER SUPPLY/RETURN
—CST—	CLEAN STEAM PIPING
—CWS/R—	CONDENSER WATER SUPPLY/RETURN
—DTS/R—	DUAL TEMP. WATER SUPPLY/RETURN
—GS/R—	GEOTHERMAL WATER SUPPLY/RETURN
—HPC—	HIGH PRESSURE STEAM CONDENSATE
—HPS(#)—	HIGH PRESSURE STEAM; (#) DENOTES PRESSURE
—HPS/R—	HEAT PUMP WATER SUPPLY/RETURN
—HRS/R—	HEAT RECOVERY SUPPLY/RETURN PIPING
—HWS/R—	HEATING WATER SUPPLY/RETURN
—LPC—	LOW PRESSURE STEAM CONDENSATE
—LPS(#)—	LOW PRESSURE STEAM; (#) DENOTES PRESSURE
—MPC—	MEDIUM PRESSURE STEAM RETURN
—MPS(#)—	MEDIUM PRESSURE STEAM; (#) DENOTES PRESSURE
—SPD—	STEAM CONDENSATE PUMPED DISCHARGE
—SVT—	STEAM VENT PIPING
—D(XXX)—	PIPING TO BE DEMOLISHED - (XXX) DENOTES SYSTEM
—E(XXX)—	EXISTING PIPING - (XXX) DENOTES SYSTEM
—A(XXX)—	ABANDONED IN PLACE PIPING - (XXX) DENOTES SYSTEM
	TWO-WAY CONTROL VALVE
	THREE-WAY CONTROL VALVE
	AUTOMATIC AIR VENT (AAV)
	MANUAL AIR VENT (MAV)
	MANUAL BALANCING VALVE (BV)
	BALL VALVE
	BUTTERFLY VALVE
	TRIPLE DUTY VALVE (TDV)
	STRAINER
	MANUAL ISOLATION VALVE
	GLOBE VALVE
	OS&Y (GATE) VALVE
	PRESSURE REDUCING VALVE (STEAM, GAS, WATER, ETC.)
	AUTO-FLOW CONTROL VALVE
	CHECK VALVE
	DOUBLE CHECK VALVE ASSEMBLY
	FLEXIBLE PIPE CONNECTION
	FLOW METER (VENTURI)
	PIPING UNION
FS	FLOW SWITCH
PS	PRESSURE SWTICH
TS	TAMPER SWITCH
	THERMOMETER
	PETE'S PLUG; TEMPERATURE/PRESSURE PORT

NOTE: NOT ALL SYMBOLS AND ABBREVIATIONS MAY BE USED ON THIS PROJECT

APPLICABLE BUILDING CODES

APPLICABLE BUILDING CODES	DOCUMENT	YEAR
ACCESSIBLE AND USEABLE BUILDINGS AND FACILITIES	ANSI A117.1	2009
FIRE SPRINKLER CODE	NFPA 13	2013
INTERNATIONAL BUILDING CODE (IBC)	STATE EDITION	2015
INTERNATIONAL ENERGY CONSERVATION CODE (IECC) OR ASHRAE 90.1	STATE EDITION	2012 OR 2010
INTERNATIONAL FIRE CODE (IFC)	STATE EDITION	2015
INTERNATIONAL FUEL GAS CODE (IFGC)	STATE EDITION	2015
INTERNATIONAL MECHANICAL CODE (IMC)	STATE EDITION	2015
KENTUCKY PLUMBING CODE	STATE EDITION	2015
INTERNATIONAL EXISTING BUILDING CODE (IEBC)	STATE EDITION	2009
NATIONAL ELECTRIC CODE (NEC)	NFPA 70	2017
NATIONAL FIRE ALARM & SIGNALING CODE	NFPA 72	2013
UNIFORM STATEWIDE BUILDING CODE	STATE EDITION	2018

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
WILLIAM EPPS, JR.
PE-19127
REGISTERED PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company
10411 Meeting Street | Louisville, KY 40059 | 502.326.3085 | cmta.com

LEGRANDE ELEMENTARY ADDITION AND RENOVATION
BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

MECHANICAL LEGEND

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	ADB
CHECKED	JRE

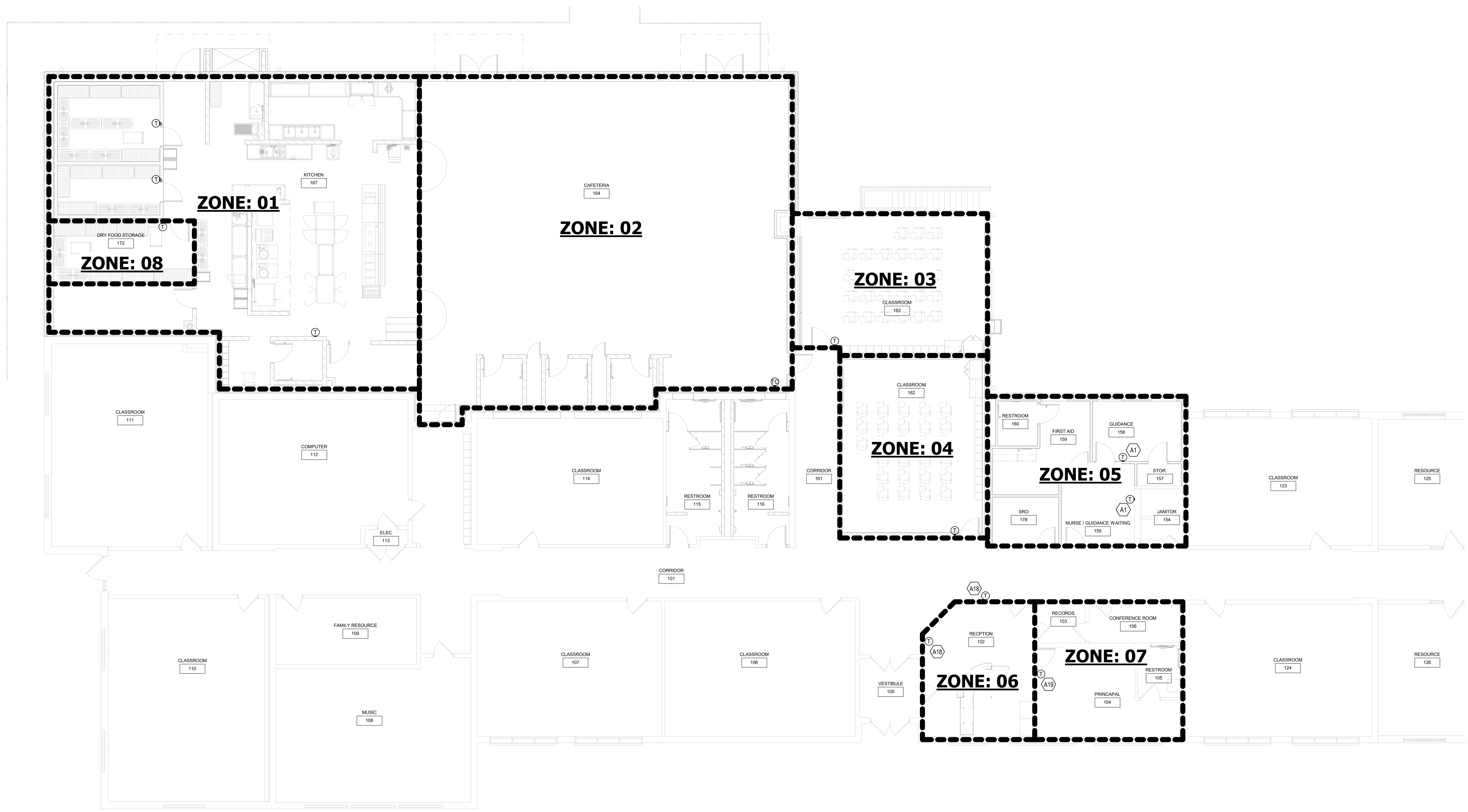
REVISIONS

No.	Description	Date

SHEET

M1.0

TAGGED NOTES	
A1	PROVIDE ZONE HEAT PUMP WITH 2 TEMPERATURE SENSORS FOR AVERAGE TEMPERATURE CONTROL.
A18	EXISTING THERMOSTAT TO REMAIN.
A19	RELOCATE THERMOSTAT TO THIS LOCATION AND RECONNECT TO EXISTING EQUIPMENT.



1 MECHANICAL ZONING PLAN
SCALE: 1/8" = 1'-0"

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY WILLIAM EPPS, JR. PE-19127 PROFESSIONAL ENGINEER

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION
BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

MECHANICAL ZONING PLAN

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	ADB
CHECKED	JRE

REVISIONS

No.	Description	Date

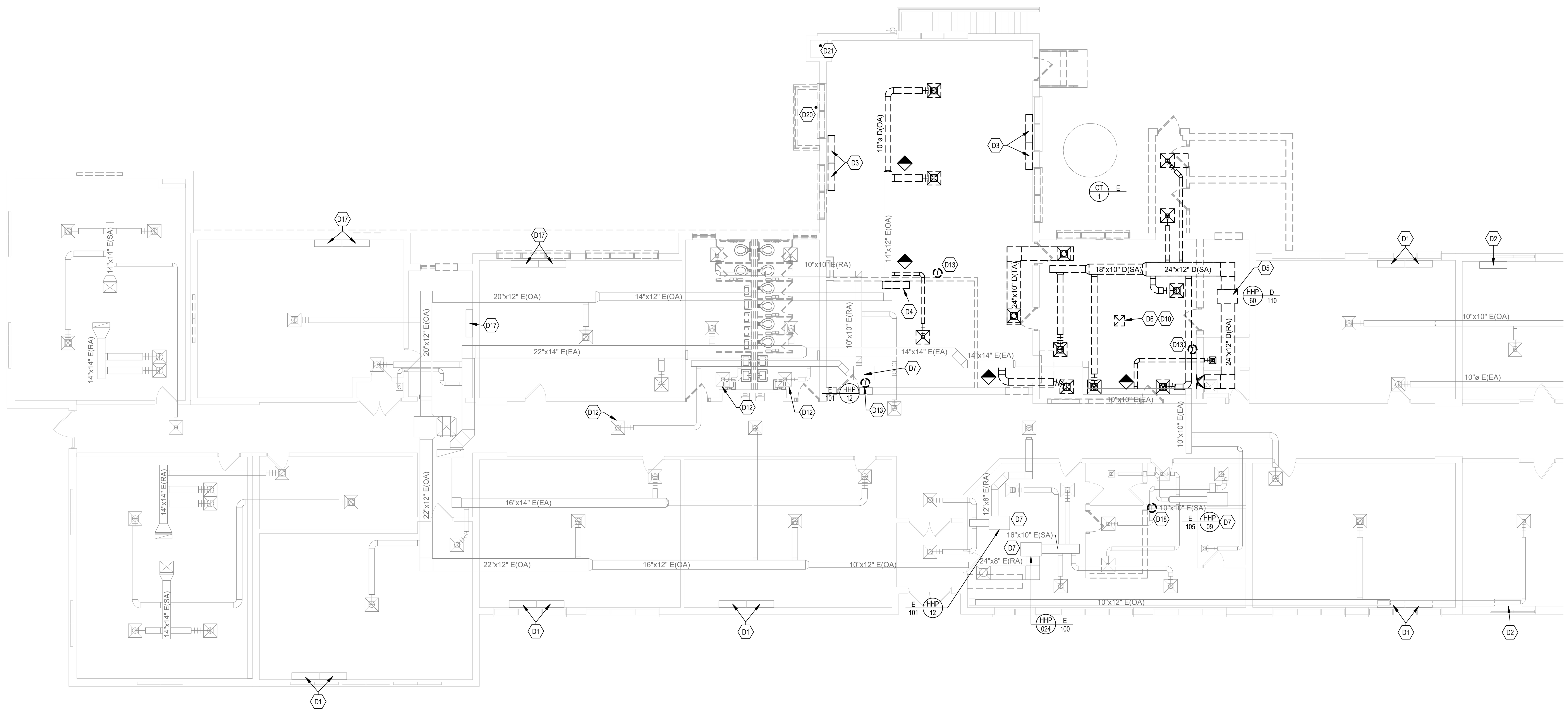
SHEET
M1.1

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:11 PM

SHERMAN CARTER BARNHART ARCHITECTS

TAGGED NOTES

D1	CONSOLE HEAT PUMPS TWINNED TOGETHER TO REMAIN.
D2	CONSOLE HEAT PUMP TO REMAIN. PROTECT DURING CONSTRUCTION.
D3	CONSOLE HEAT PUMP TO BE SAFELY REMOVED AND REUSED FOR NEW CLASSROOMS. SEE NEW WORK PLAN FOR ADDITIONAL INFORMATION.
D4	COMPLETELY REMOVE EXISTING CONSOLE HEAT PUMPS INCLUDING ASSOCIATED PIPING, INSULATION, SUPPORTS AND CONTROLS.
D5	COMPLETELY REMOVE EXISTING CEILING HUNG UNIT INCLUDING ASSOCIATED DUCTWORK, GRILLES, INSULATION, SUPPORTS AND CONTROLS.
D6	COMPLETELY REMOVE EXISTING KITCHEN HOOD INCLUDING ASSOCIATED DUCTWORK, SUPPORTS AND CONTROLS. REMOVE EXHAUST FAN ON ROOF.
D7	EXISTING HVAC TO REMAIN. PROTECT DURING CONSTRUCTION. PRETEST AIRFLOWS PRIOR TO DEMOLITION AND REPORT TO ENGINEER.
D10	COMPLETELY REMOVE KITCHEN EXHAUST FAN INCLUDING ASSOCIATED POWER AND CONTROLS. CAP ROOF CURB. SEE ROOF CURB CAP DETAIL FOR ADDITIONAL INFORMATION.
D12	EXISTING SUPPLY DIFFUSER TO REMAIN. PRETEST AIRFLOWS PRIOR TO DEMOLITION AND REPORT TO ENGINEER.
D13	EXISTING THERMOSTAT CONTROLS TO BE REMOVED.
D17	CONSOLE HEAT PUMPS TO BE SAFELY REMOVED TO DEMO CONDENSATE AND REWORK PIPING. CONSOLE HEAT PUMPS TO BE REINSTALLED IN THE SAME LOCATION. SEE NEW WORK DRAWINGS FOR ADDITIONAL INFORMATION.
D18	EXISTING THERMOSTAT CONTROLS TO BE RELOCATED. SEE M1.1 FOR NEW LOCATION. RECONNECT TO EXISTING EQUIPMENT.
D20	OUTSIDE AIR DUCT TO BE REMOVED. SEE M4.0 FOR CONTINUATION.
D21	EXHAUST AIR DUCT TO BE REMOVED. SEE M4.0 FOR CONTINUATION.



1 FIRST FLOOR PLAN - MECHANICAL DEMOLITION

SCALE: 1/8" = 1'-0"

STATE OF KENTUCKY
WILLIAM EPPS, JR.
PE-19127
PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277

HART COUNTY BOARD OF EDUCATION

HORSE CAVE, KY

FIRST FLOOR PLAN - MECHANICAL DEMOLITION

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	ADB
CHECKED	JRE

REVISIONS

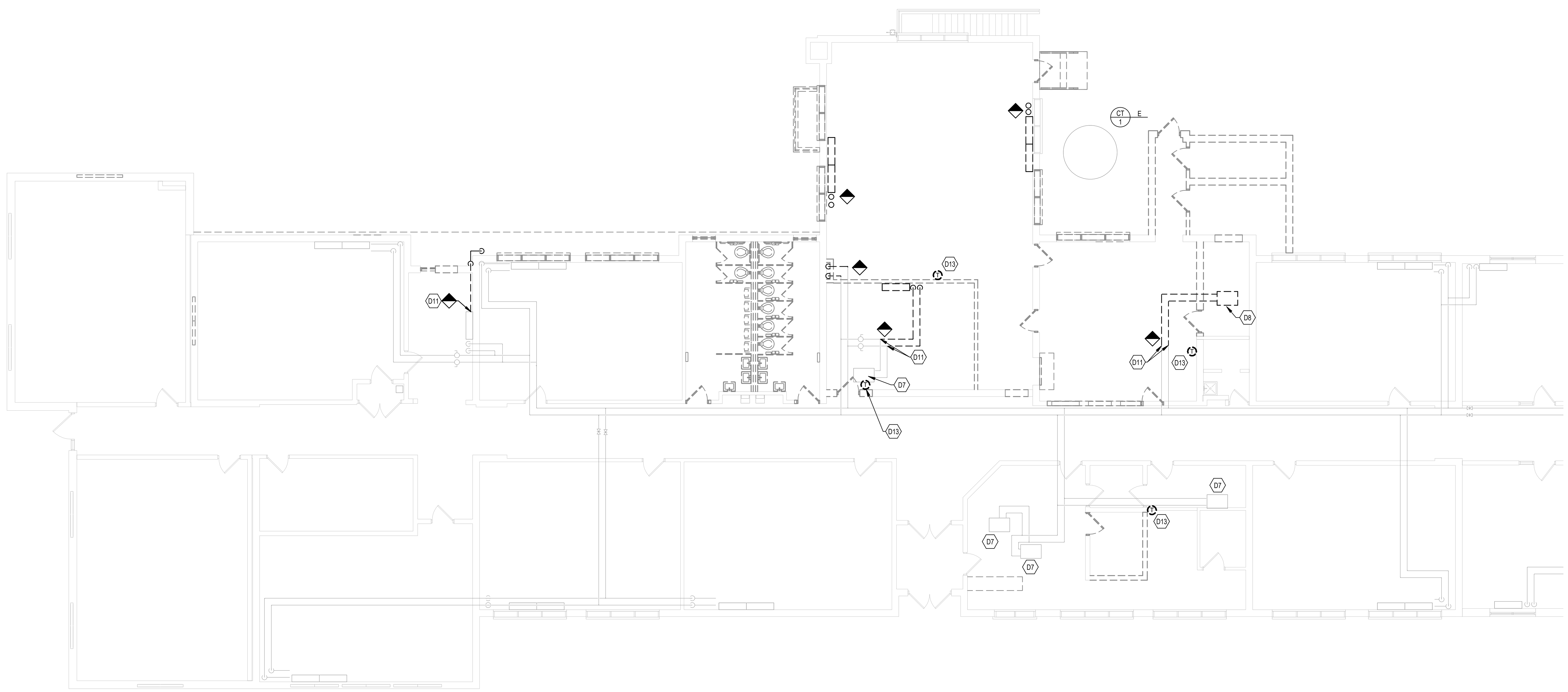
No.	Description	Date

SHEET

M2.1

TAGGED NOTES

D7	EXISTING HVAC TO REMAIN. PROTECT DURING CONSTRUCTION. PRETEST AIRFLOWS PRIOR TO DEMOLITION AND REPORT TO ENGINEER.
D8	COMPLETELY REMOVE EXISTING CEILING HUNG UNIT INCLUDING ASSOCIATED HYDRONIC PIPING, CONDENSATE, VALVES, SUPPORTS AND CONTROLS.
D11	REMOVE PIPING TO POINT INDICATED. REFER TO NEW WORK PLANS FOR ADDITIONAL INFORMATION.
D13	EXISTING THERMOSTAT CONTROLS TO BE REMOVED.



1 FIRST FLOOR PLAN - HYDRONICS DEMOLITION

SCALE: 1/8" = 1'-0"

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY WILLIAM EPPS, JR. PE-19127 PROFESSIONAL ENGINEER

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277

HART COUNTY BOARD OF EDUCATION

HORSE CAVE, KY

FIRST FLOOR PLAN - HYDRONICS DEMOLITION

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	ADB
CHECKED	JRE

REVISIONS

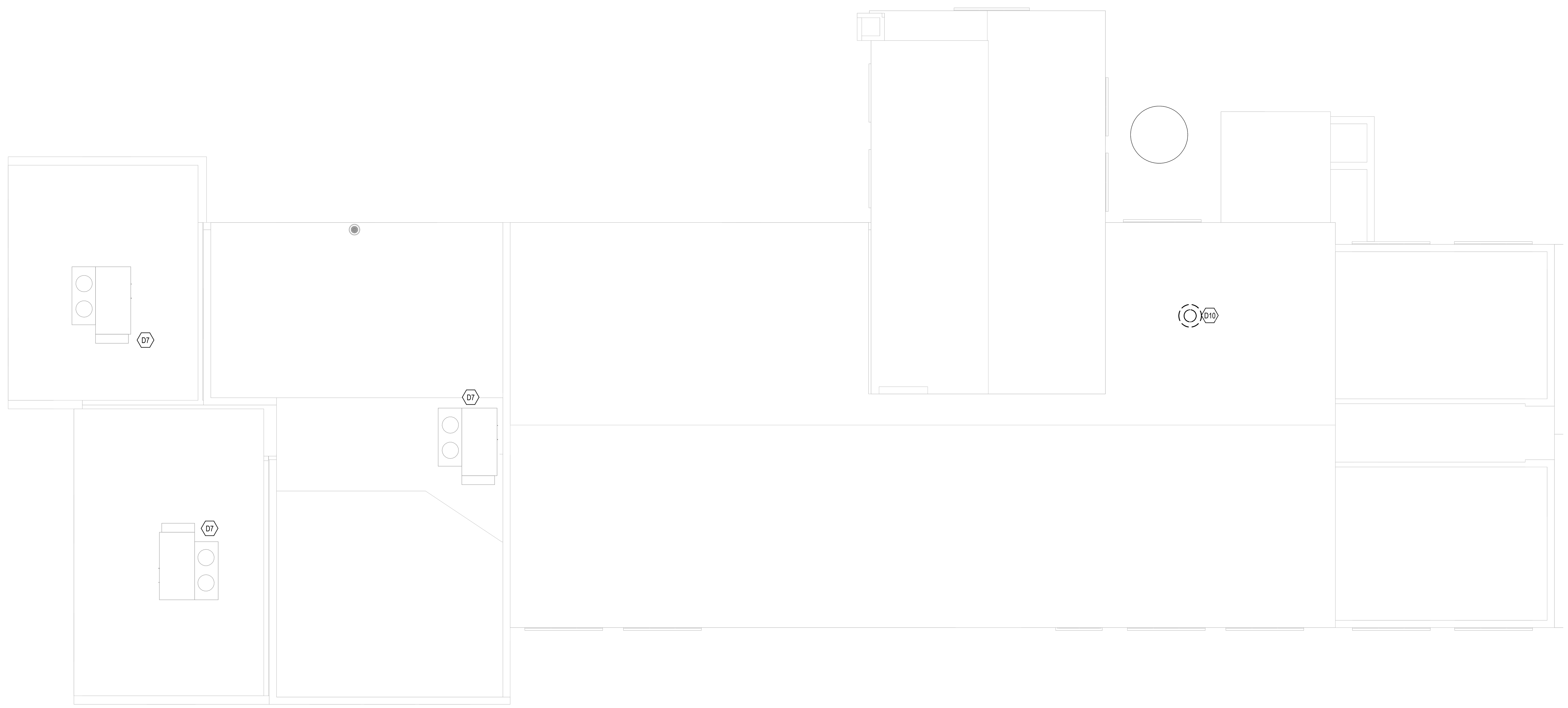
No.	Description	Date

SHEET

M2.2

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:15 PM

TAGGED NOTES	
D7	EXISTING HVAC TO REMAIN. PROTECT DURING CONSTRUCTION. PRETEST AIRFLOWS PRIOR TO DEMOLITION AND REPORT TO ENGINEER.
D10	COMPLETELY REMOVE KITCHEN EXHAUST FAN INCLUDING ASSOCIATED POWER AND CONTROLS. CAP ROOF CURB. SEE ROOF CURB CAP DETAIL FOR ADDITIONAL INFORMATION.



1 ROOF PLAN - MECHANICAL DEMOLITION

SCALE: 1/8" = 1'-0"

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
WILLIAM EPPS, JR.
PE-19127
PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ROOF PLAN - MECHANICAL DEMOLITION

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	ADB
CHECKED	JRE

REVISIONS

No.	Description	Date

SHEET

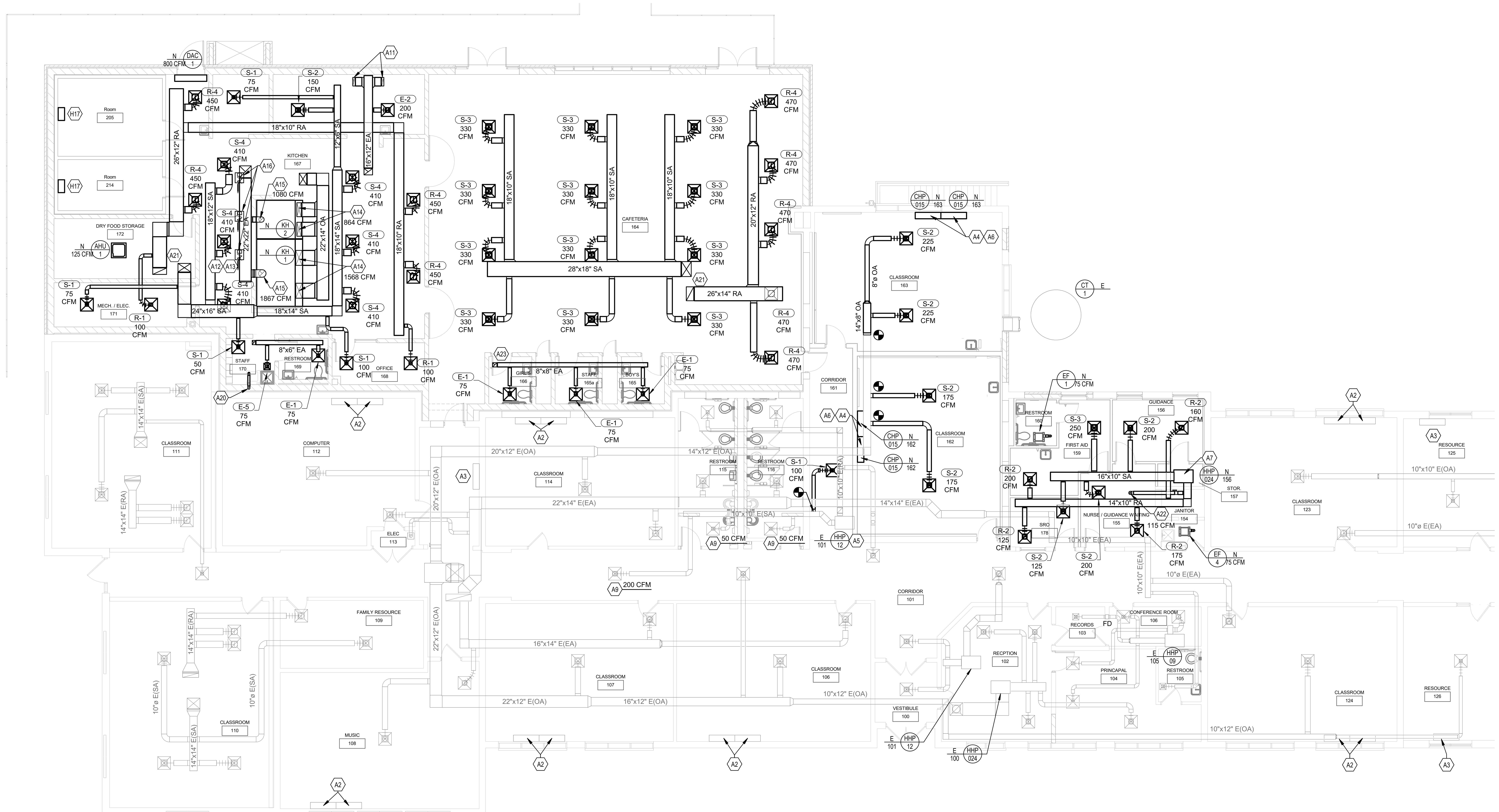
M2.3

LEGRANDE ELEMENTARY - IMC 2015/ASHRAE 62.1-2010 - VENTILATION CALCULATIONS

ROOM NUMBER	ROOM NAME	ROOM TYPE	Az FLOOR AREA (SF)	#/1000 SF	ASHRAE OCCUPANCY (Pz)	ASHRAE OA PER PERSON (Rp)	(Pz * Rp)	ASHRAE REQUIRED CFM/SF (Ra)	(Ra * Az)	Ez FOR SQFT ONLY	Ez ZONE AIR DISTRIBUTION EFFECTIVENESS	ASHRAE OA AIRFLOW (CFM)	ACTUAL OA AIRFLOW (CFM)
167	KITCHEN	KITCHEN (COOKING)	1511	0		0		0	0	0	1.0	0	0
168	OFFICE	OFFICE SPACE	92	5	1	5	5	0.06	6	6	1.0	11	15
169	RESTROOM	RESTROOM	50	0		0		0	0	0	1.0	0	0
170	STAFF	BREAKROOM	55	50	3	5	14	0.12	7	7	1.0	21	25
171	MECH/ELEC	MECHANICAL ROOM	152	0		0		0	0	0	1.0	0	0
172	DRY FOOD STORAGE	STORAGE ROOM	207	0		0		0	0	0	1.0	0	0
164	CAFETERIA	CAFETERIA	2687	100	269	7.5	2015	0.18	484	484	1.0	2499	2500
165	BOY'S	RESTROOM	49	0		0		0	0	0	1.0	0	0
165A	STAFF	RESTROOM	49	0		0		0	0	0	1.0	0	0
166	GIRL'S	RESTROOM	49	0		0		0	0	0	1.0	0	0
161	CORRIDOR	CORRIDOR	202	0		0		0.06	13	13	1.0	13	15
162	CLASSROOM	CLASSROOM (AGE 9+)	635	35	22	10	222	0.12	77	77	1.0	299	300
163	CLASSROOM	CLASSROOM (AGE 9+)	638	35	22	10	223	0.12	77	77	1.0	300	305
154	JANITOR	MECHANICAL ROOM	55	0		0		0	0	0	1.0	0	0
155	NURSE/GUIDANCE WAITING	RECEPTION	143	30	4	5	21	0.06	9	9	1.0	30	35
156	GUIDANCE	OFFICE SPACE	141	5	1	5	4	0.06	9	9	1.0	13	15
157	RECORDS	STORAGE ROOM	26	0		0		0	0	0	1.0	0	0
159	FIRST AID	DAYCARE SICKROOM	161	25	2	10	20	0.18	29	29	1.0	49	50
160	RESTROOM	RESTROOM	45	0		0		0	0	0	1.0	0	0
178	SRO	OFFICE SPACE	83	5	1	5	5	0.06	5	5	1.0	10	10

TAGGED NOTES

A2	EXISTING CONSOLE HEAT PUMPS TWINNED TOGETHER TO REMAIN. PROTECT DURING CONSTRUCTION.
A3	EXISTING CONSOLE HEAT PUMP TO REMAIN. PROTECT DURING CONSTRUCTION.
A4	CONSOLE HEAT PUMPS FROM ENERGY SOLUTIONS PACKAGE TO BE REUSED IN THIS LOCATION. HEAT PUMPS TO BE TWINNED TOGETHER.
A5	EXISTING HVAC TO REMAIN. PROTECT DURING CONSTRUCTION. EXISTING DUCTWORK AND GRILLES TO BE THOROUGHLY CLEANED AND REBALANCED. PRETEST AIRFLOWS PRIOR TO REBALANCING AND REPORT TO ENGINEER. ROOFTOP UNITS SHALL REMAIN.
A6	INSTALL NEW CONSOLE HEAT PUMP PER DETAIL.
A7	INSTALL NEW HEAT PUMP PER DETAIL.
A9	EXISTING SUPPLY DIFFUSER TO REMAIN. BALANCE DIFFUSER TO NOTED CFM.
A11	EXTEND 16X4 DUCT DOWN TO DISHWASHER AND CONNECT WITH BALANCING DAMPER. BALANCE FOR 400 CFM. ALL DUCTWORK SHALL BE WELDED AND POLISHED STAINLESS STEEL.
A12	GREASE DUCTWORK SHALL BE WELDED STEEL CONSTRUCTION SLOPED BACK TO HOOD AT 2% GRADE (MIN.). WRAP ENTIRE DUCT WITH GREASE DUCT FIRE PROTECTION SYSTEM EQUAL TO JOHN MANVILLE "SUPER FIRETEMP" DUCT ENCLOSURE AND FIRE STOP SYSTEM MEETING ASTM 814 (3 HOUR ENCLOSURE).
A13	PROVIDE GREASE DUCT CLEANOUTS AT 20'-0" INTERVALS AND 10'-0" FROM ENDS AND AT ALL CHANGES IN DIRECTION.
A14	EXTEND AND CONNECT INDICATED SUPPLY DUCT TO KITCHEN HOOD SUPPLY PLENUM AND BALANCE TO AIRFLOW INDICATED.
A15	CONNECT GREASE DUCT TO KITCHEN HOOD AND BALANCE TO AIRFLOW INDICATED.
A16	PROVIDE ACCESS DOOR IN KITCHEN EXHAUST DUCT PER CODE.
A20	6"Ø DRYER VENT. PROVIDE DRYER BOX, LINT TRAP AND CLEANOUT. TERMINATE VENT AT ROOF AS SHOWN ON ROOF PLAN. TERMINATE WITH GOOSENECK FITTING.
A21	EXTEND UNIT INLET/OUTLET DUCT SIZES THROUGH ROOF AND TRANSITION TO INDICATED DUCT SIZE IN JOIST SPACE.
A22	4"Ø OA THROUGH ROOF WITH GOOSENECK DISCHARGE. BALANCE WITH DAMPER AT CFM INDICATED. REFER TO DETAIL FOR ADDITIONAL INFORMATION.
A23	8X8 EA DUCT UP THRU ROOF. SEE M3.2 FOR CONTINUATION.
H17	REFER TO KITCHEN EQUIPMENT DRAWINGS FOR FREEZER/COOLER COMPRESSOR/EVAPORATOR INFORMATION.



1 FIRST FLOOR PLAN - MECHANICAL NEW WORK

SCALE: 1/8" = 1'-0"

SHERMAN CARTER BARNHART ARCHITECTS

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277

HART COUNTY BOARD OF EDUCATION

HORSE CAVE, KY

FIRST FLOOR PLAN - MECHANICAL NEW WORK

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	ADB
CHECKED	JRE

REVISIONS

No.	Description	Date

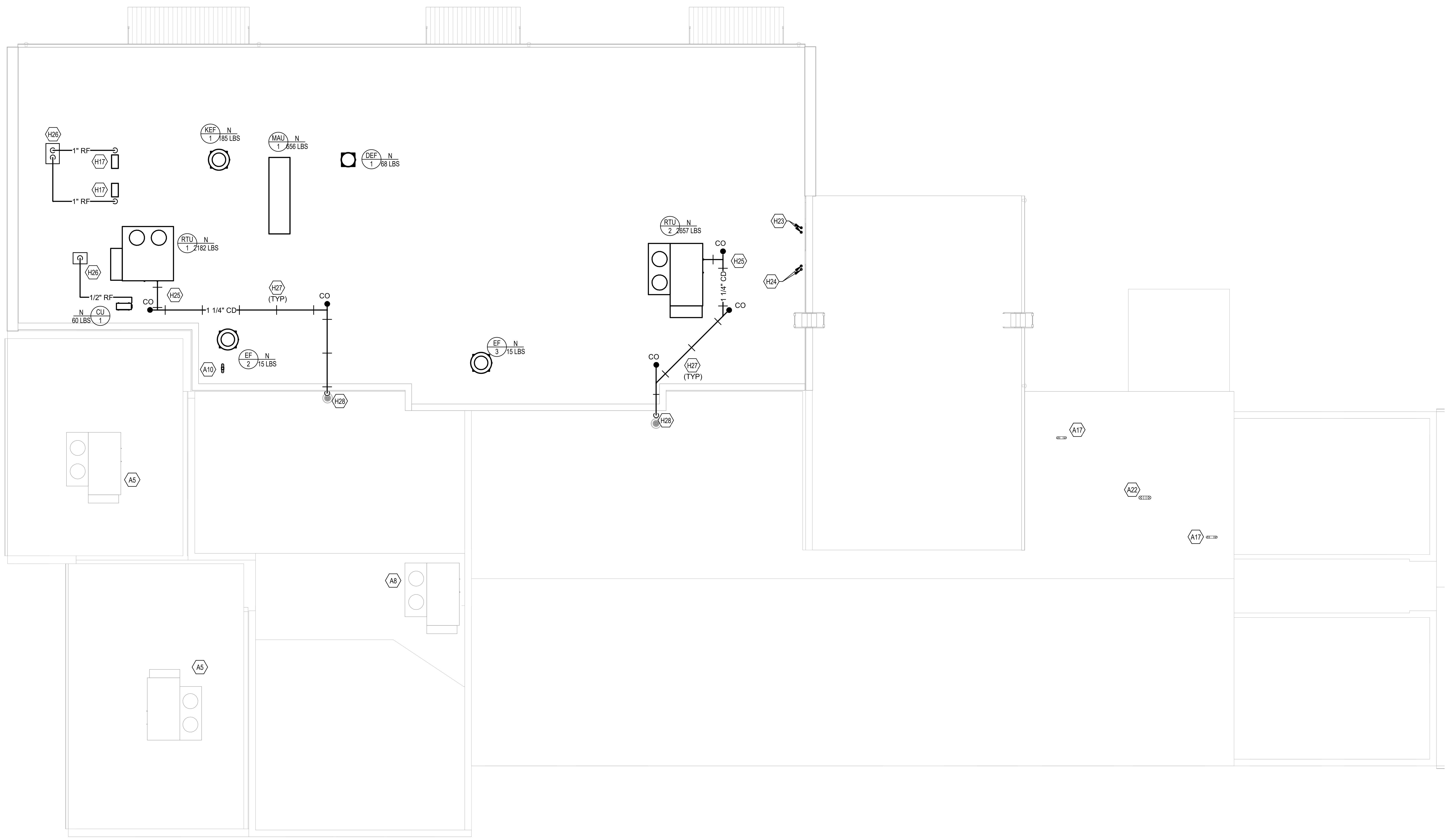
SHEET

M3.1

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:20 PM

TAGGED NOTES

A5	EXISTING HVAC TO REMAIN. PROTECT DURING CONSTRUCTION. EXISTING DUCTWORK AND GRILLES TO BE THOROUGHLY CLEANED AND REBALANCED. PRETEST AIRFLOWS PRIOR TO REBALANCING AND REPORT TO ENGINEER. ROOFTOP UNITS SHALL REMAIN.
A8	PROVIDE ROOF CURB CAP PER DETAIL. COORDINATE WITH CURRENT ROOF WARRANTY AND INSTALLER.
A10	EXTEND DRYER VENT DUCT UP THROUGH ROOF. SEE GOOSENECK ROOF PENETRATION DETAIL FOR ADDITIONAL INFORMATION. PROVIDE LINT TRAP CLEANOUT AT DRYER IF APPLICABLE.
A17	6"Ø EA DUCT FROM EXHAUST FAN. TERMINATE DUCT WITH ROOF CURB, GOOSENECK FITTING AND BIRDSCREEN.
A22	4"Ø OA THROUGH ROOF WITH GOOSENECK DISCHARGE. BALANCE WITH DAMPER AT CFM INDICATED. REFER TO DETAIL FOR ADDITIONAL INFORMATION.
H17	REFER TO KITCHEN EQUIPMENT DRAWINGS FOR FREEZER/COOLER COMPRESSOR/EVAPORATOR INFORMATION.
H23	EXTEND COMBUSTION AIR INTAKE TERMINATION THROUGH ROOF AND TURN DOWN WITH 90° ELBOW. PROVIDE WITH MESH SCREEN. SEE TYPICAL COMBUSTION AIR ROOF PENETRATION DETAIL FOR ADDITIONAL INFORMATION.
H24	EXTEND FLUE GAS EXHAUST TERMINATION THROUGH ROOF AND MINIMUM 4' ABOVE INTAKE TERMINATION. TERMINATION TO BE MINIMUM 4' FROM INTAKE TERMINATION. SEE TYPICAL COMBUSTION AIR ROOF PENETRATION DETAIL FOR ADDITIONAL INFORMATION.
H25	EXTEND CONDENSATE TO ROOF DRAIN.
H26	ROUTE THE PIPING DOWN THROUGH THE ROOF. REFER TO M4.2 FOR CONTINUATION. PROVIDE CURB WITH CHASE. REFER TO PIPE CHASE ROOF CURB DETAIL FOR ADDITIONAL INFORMATION.
H27	PROVIDE PIPE SUPPORTS FOR ROOFTOP PIPING 8'-0" ON CENTER.
H28	CONDENSATE PIPE DOWN TO ROOF DRAIN. SECURE TO STRUCTURE.



1 ROOF PLAN - MECHANICAL NEW WORK

SCALE: 1/8" = 1'-0"

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY WILLIAM EPPS, JR. PE-19127 PROFESSIONAL ENGINEER

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ROOF PLAN - MECHANICAL NEW WORK

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	ADB
CHECKED	JRE

REVISIONS

No.	Description	Date

SHEET

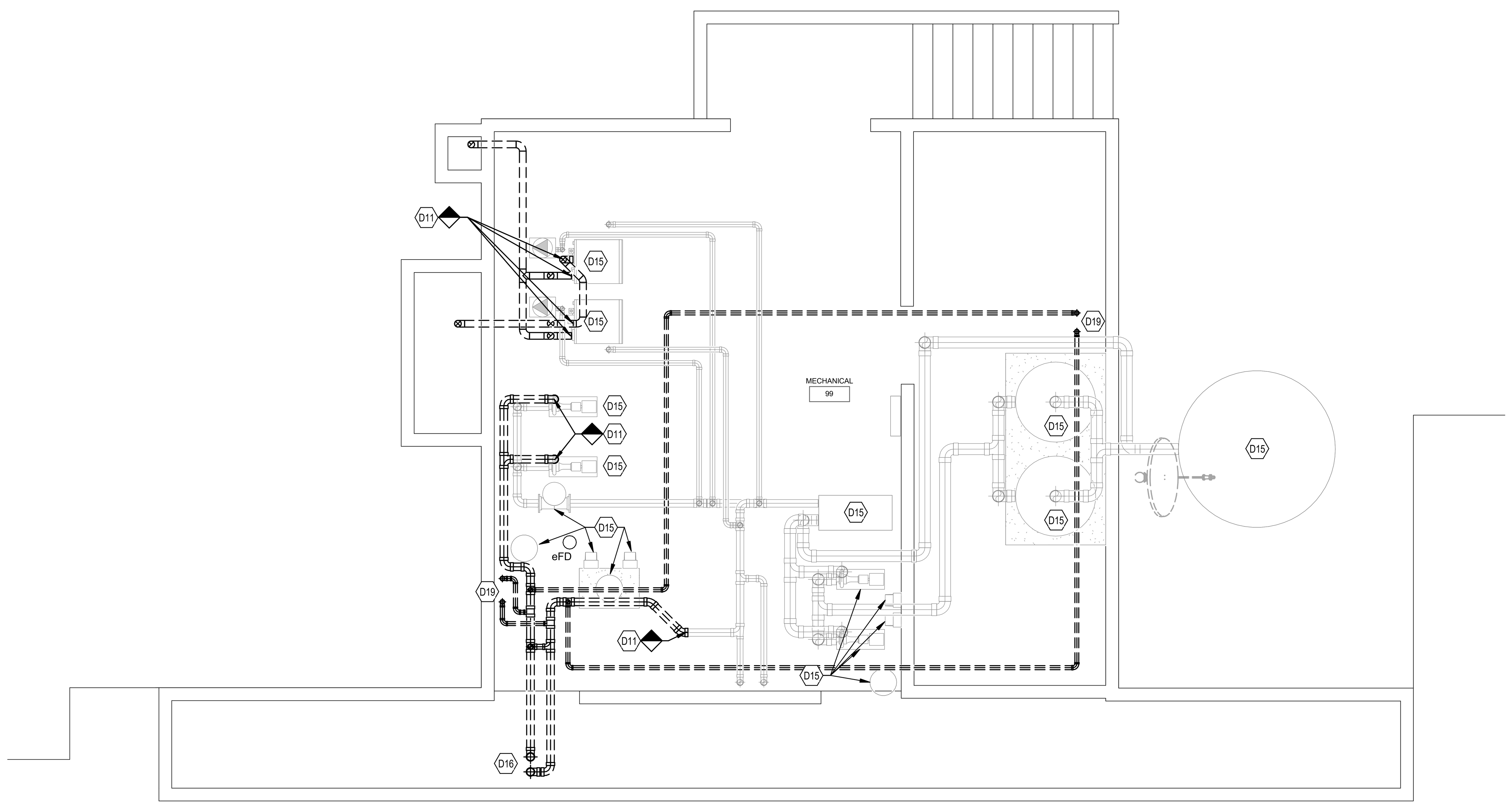
M3.2

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:21 PM

SHERMAN CARTER BARNHART ARCHITECTS

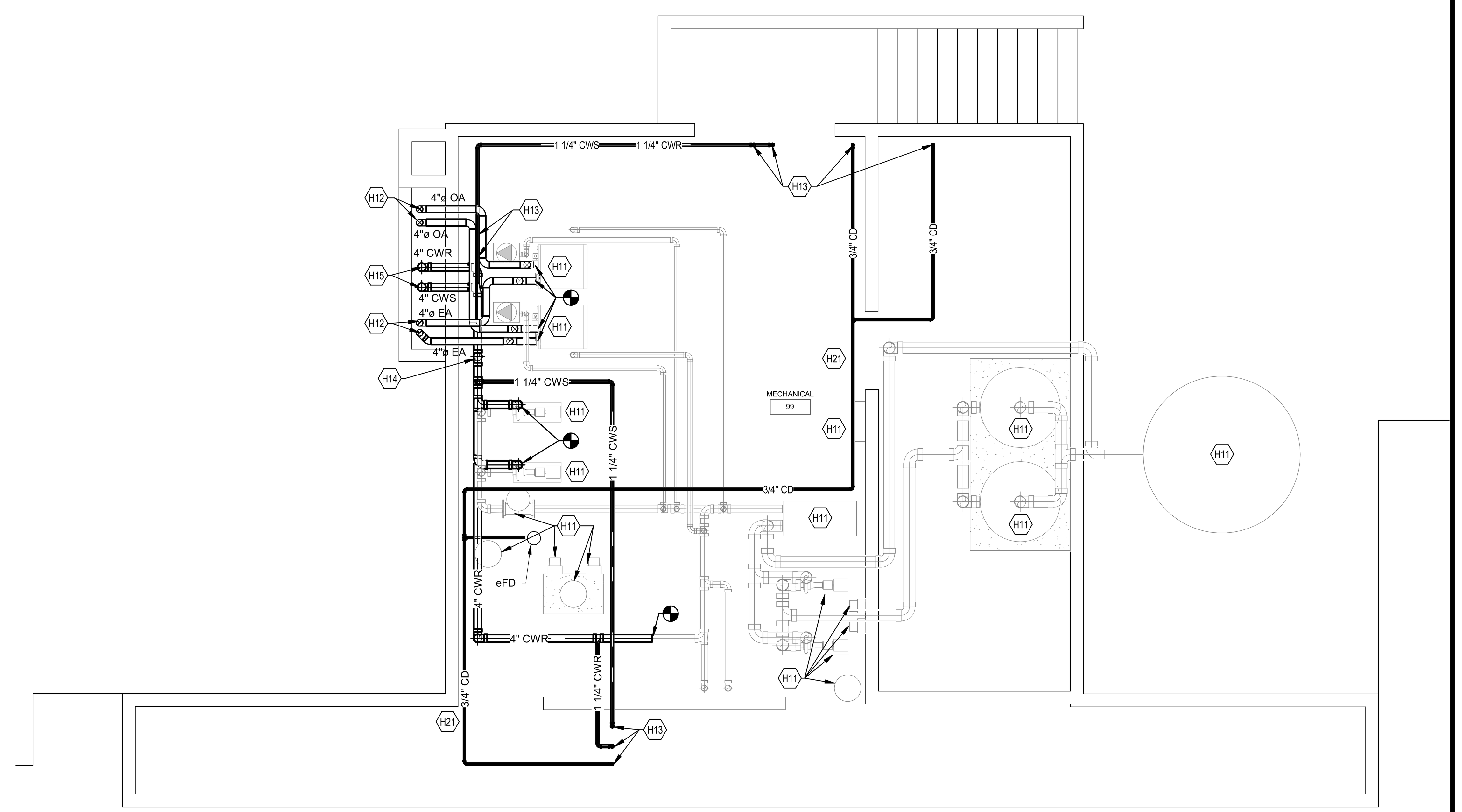
TAGGED NOTES

D11	REMOVE PIPING TO POINT INDICATED. REFER TO NEW WORK PLANS FOR ADDITIONAL INFORMATION.
D15	EXISTING EQUIPMENT TO REMAIN. PROTECT DURING CONSTRUCTION.
D16	REMOVE PIPING UP TO FIRST FLOOR. SEE FIRST FLOOR PLANS FOR CONTINUATION.
D19	DEMO PIPING UP TO CONSOLE HEAT PUMPS BEING DEMOLISHED.
H11	EXISTING EQUIPMENT TO REMAIN. PROTECT DURING CONSTRUCTION.
H12	ROUTE 4" BOILER FLUE AND AIR VENT UP FROM BOILER INSIDE CHASE AND TERMINATE AT ROOF. TERMINATE PER MANUFACTURER'S RECOMMENDATIONS.
H13	NEW PIPING UP TO NEW CONSOLE HEAT PUMPS. SEE FIRST FLOOR PLAN FOR CONTINUATION.
H14	2-1/2"Ø BYPASS LINE WITH MOTORIZED BYPASS VALVE TO MAINTAIN PUMP FLOW. COORDINATE WITH PUMP MINIMUM REQUIREMENTS. MAINTAIN ACCESS TO VALVE.
H15	ROUTE NEW PIPING UP IN CHASE. SEE FIRST FLOOR PLAN FOR CONTINUATION.
H21	EXTEND 3/4" CONDENSATE PIPE TO EXISTING FLOOR DRAIN IN MECHANICAL ROOM. DO NOT LOCATE PIPING IN SERVICE ACCESS SPACE TO CREATE A TRIP HAZARD.



1 BASEMENT FLOOR PLAN - HYDRONICS DEMOLITION

SCALE: 1/4" = 1'-0"



2 BASEMENT FLOOR PLAN - HYDRONICS NEW WORK

SCALE: 1/4" = 1'-0"

STATE OF KENTUCKY
WILLIAM EPPS, JR.
PE-19127
LICENSED PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

BASEMENT FLOOR PLAN - HYDRONICS

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	ADB
CHECKED	JRE

REVISIONS

No.	Description	Date

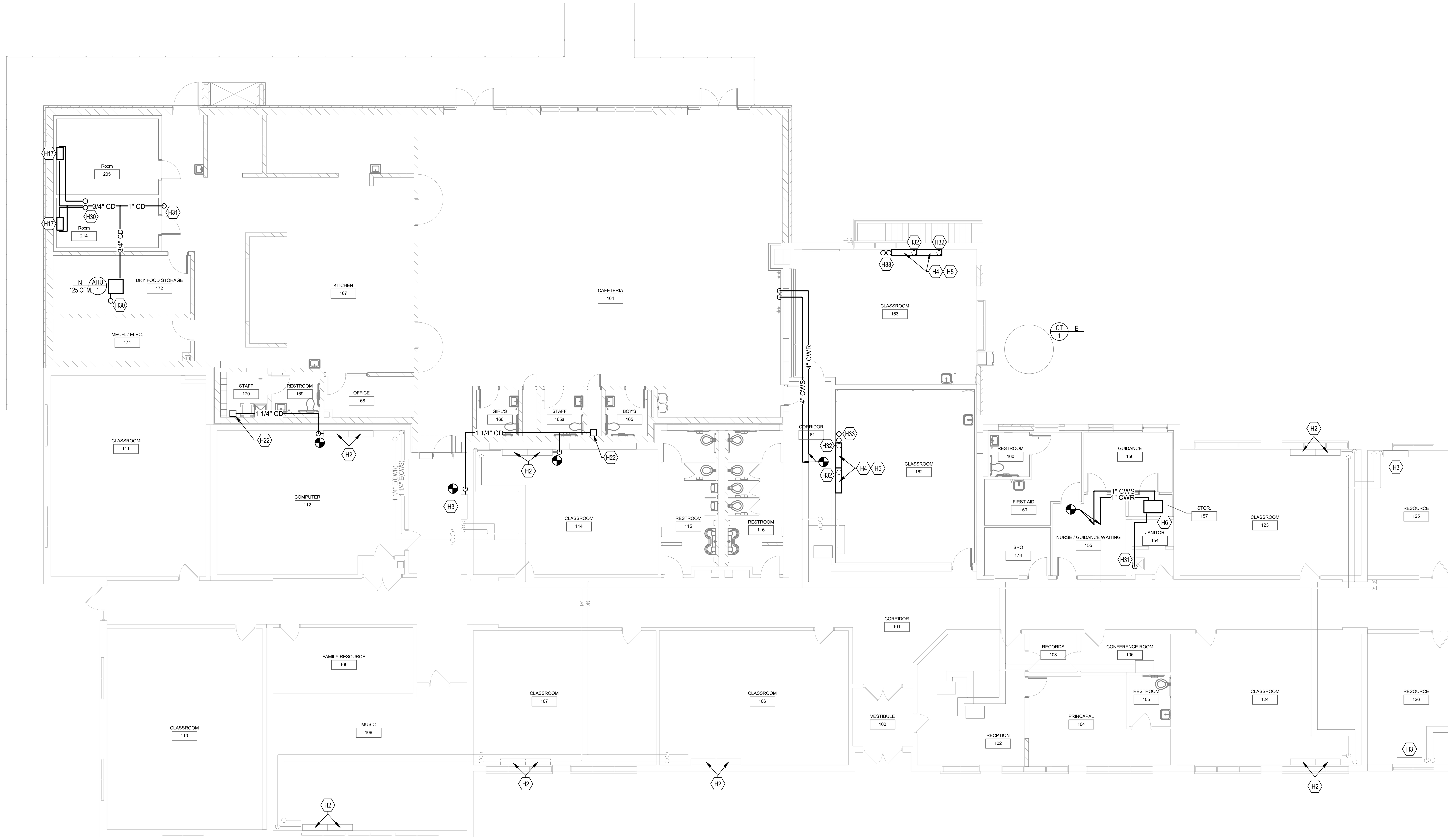
SHEET

M4.0

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:25 PM

TAGGED NOTES

H2	EXISTING CONSOLE HEAT PUMPS TWINNED TOGETHER TO REMAIN. PROTECT DURING CONSTRUCTION.
H3	EXISTING CONSOLE HEAT PUMP TO REMAIN. PROTECT DURING CONSTRUCTION.
H4	CONSOLE HEAT PUMPS FROM ENERGY SOLUTIONS PACKAGE TO BE REINSTALLED IN THIS LOCATION. HEAT PUMPS TO BE TWINNED TOGETHER.
H5	INSTALL NEW CONSOLE HEAT PUMP PER DETAIL.
H6	INSTALL NEW HEAT PUMP PER DETAIL. PROVIDE NEW HYDRONIC BRANCH PIPING AND REUSE SAME CONDENSATE PATHWAY FOR NEW CONDENSATE PIPING.
H17	REFER TO KITCHEN EQUIPMENT DRAWINGS FOR FREEZER/COOLER COMPRESSOR/EVAPORATOR INFORMATION.
H22	EXTEND 1-1/4" CONDENSATE PIPE UNDERSLAB TO CONDENSATE DRAIN PIT. SEE CONDENSATE DRAIN PIT DETAIL ON PLUMBING DRAWINGS FOR ADDITIONAL INFORMATION.
H30	REFRIGERANT PIPING UP THROUGH ROOF TO CONDENSER. SEE ROOF PLAN FOR CONTINUATION.
H31	ROUTE CONDENSATE AND SPILL TO FLOOR DRAIN/MOP SINK.
H32	ROUTE CONDENSATE PIPE DOWN TO BASEMENT. SEE M4.0 FOR CONTINUATION.
H33	ROUTE HYDRONICS PIPES DOWN TO BASEMENT. SEE M4.0 FOR CONTINUATION.



1 FIRST FLOOR PLAN - HYDRONICS NEW WORK

SCALE: 1/8" = 1'-0"

SHERMAN CARTER BARNHART ARCHITECTS

WILLIAM EPPS, JR. PE-19127 STATE OF KENTUCKY PROFESSIONAL ENGINEER

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

FIRST FLOOR PLAN - HYDRONICS NEW WORK

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	ADB
CHECKED	JRE

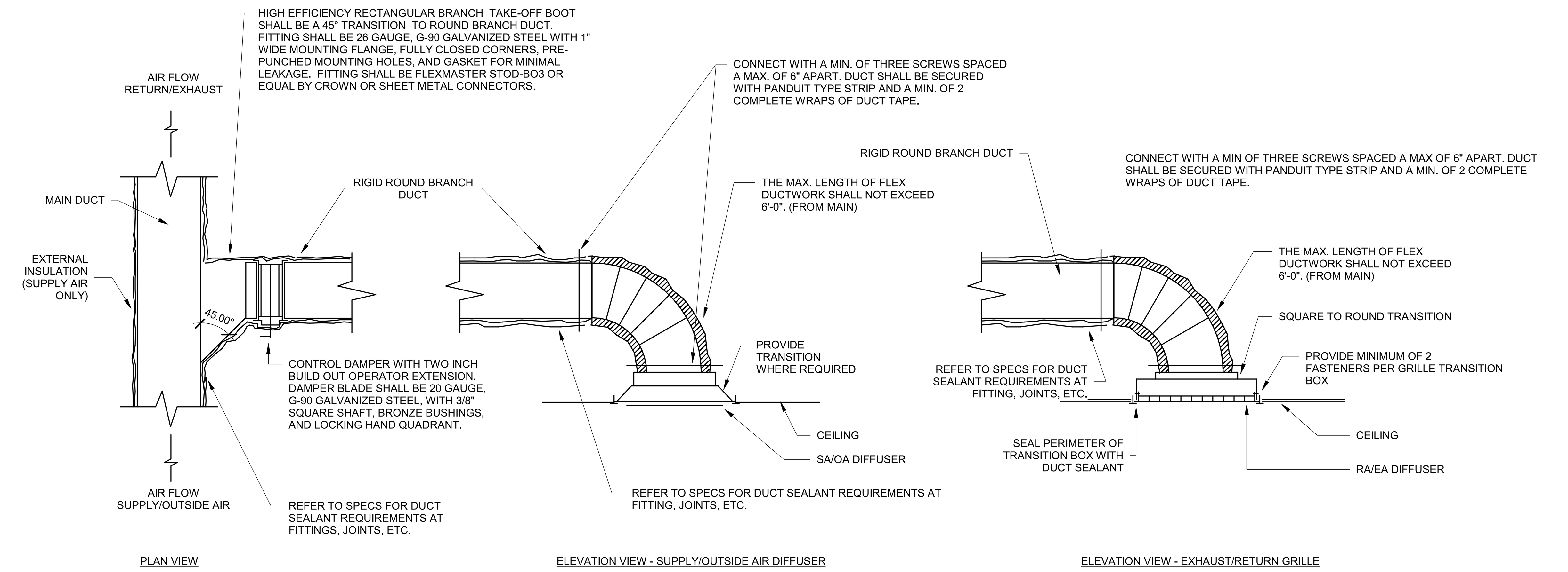
REVISIONS

No.	Description	Date

SHEET

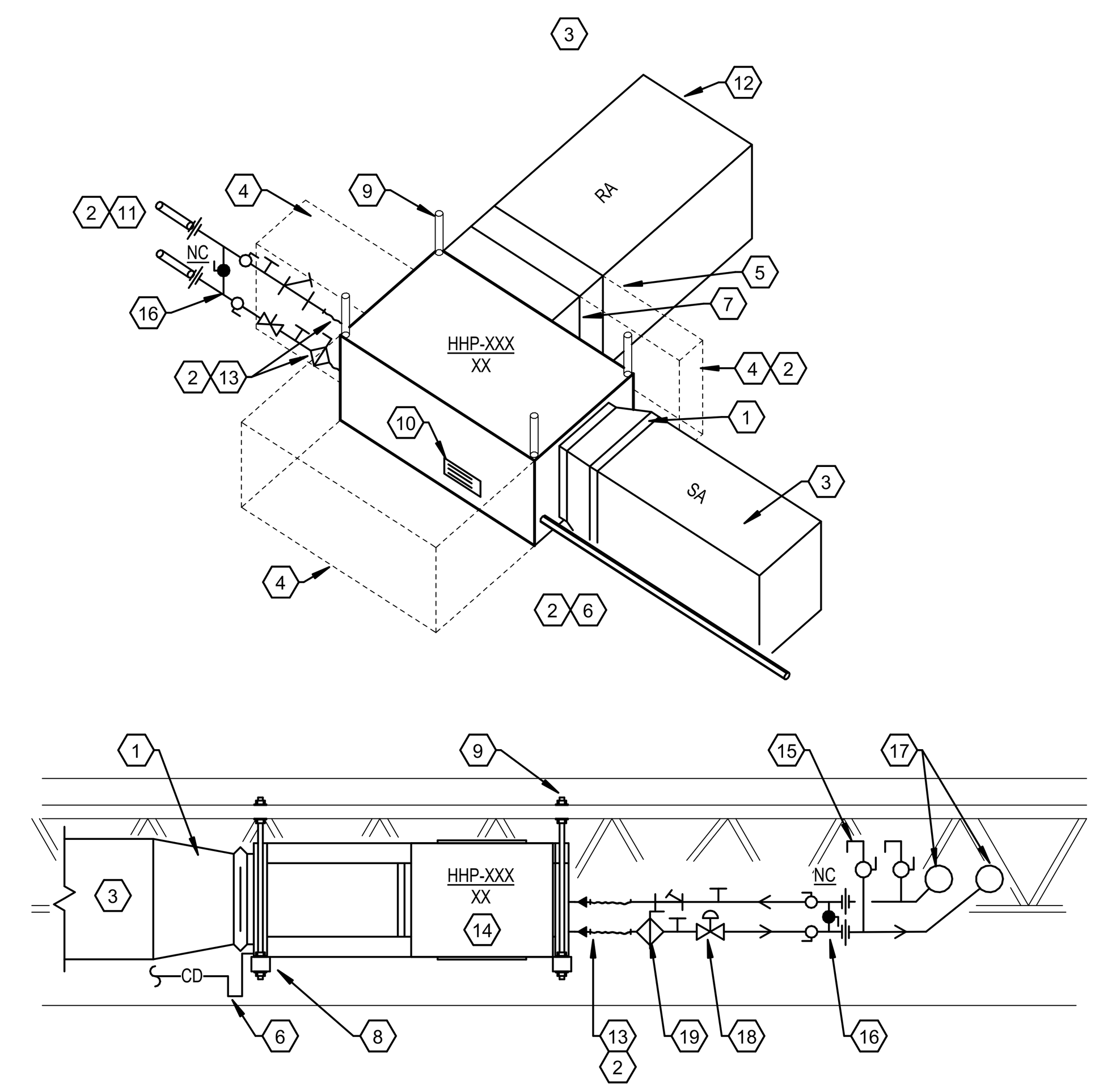
M4.1

1506.2
LEGRANDE ELEMENTARY ADDITION AND RENOVATION
8/2/2023 3:19:27 PM



1 TYPICAL RECTANGULAR-TO-ROUND BRANCH DUCT DETAIL

NO SCALE

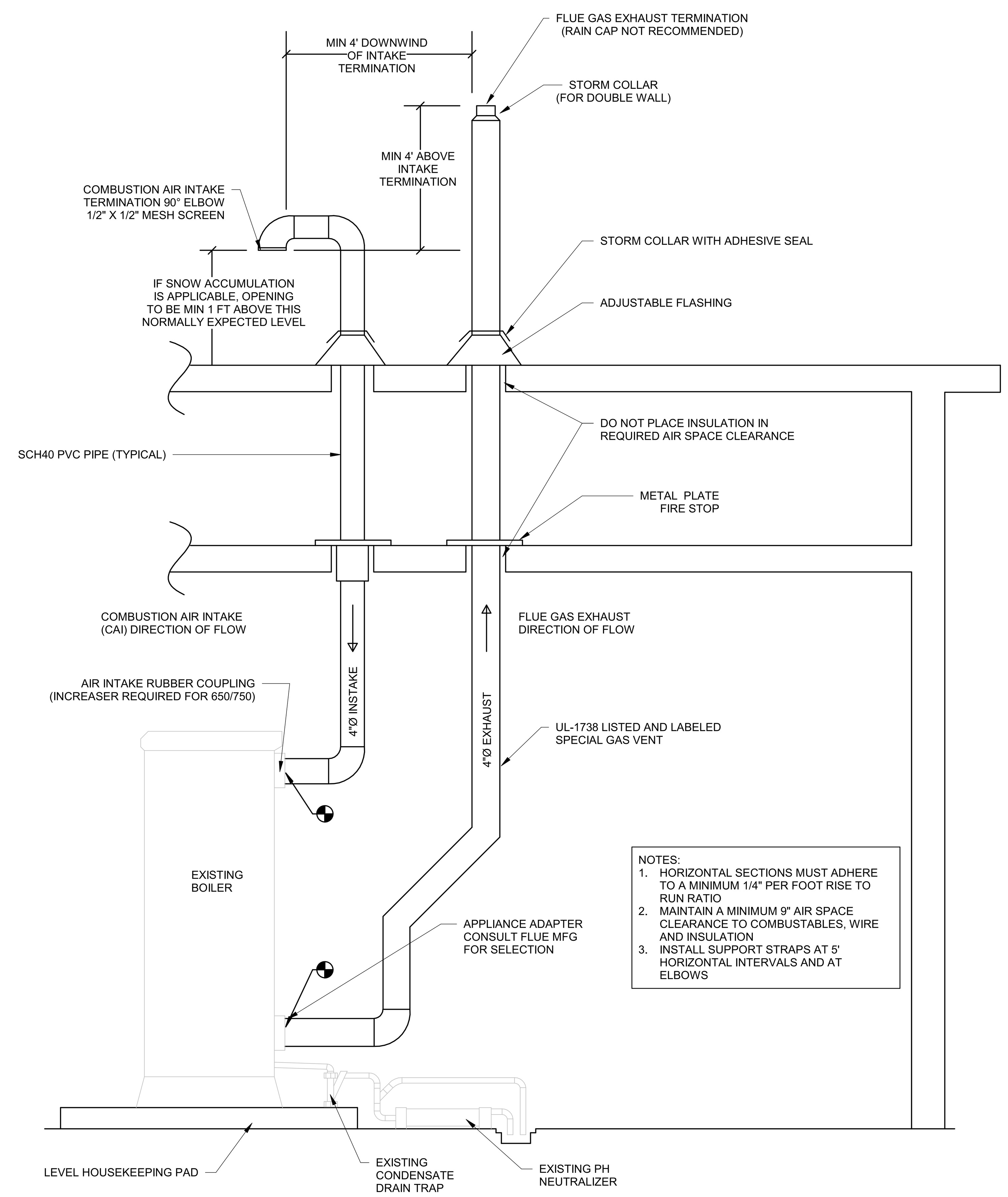


HORIZONTAL HEAT PUMP DETAIL TAG NOTES:

1. TRANSITION SA DUCTWORK TO UNIT OPENING. PROVIDE FLEXIBLE CONNECTION AT UNIT.
2. ROUTE PIPING AS TO NOT INTERFERE WITH UNIT ACCESS, FILTER REMOVAL, ETC.
3. OUTSIDE AIR IS DELIVERED TO SPACE SEPARATELY FROM WSHP.
4. MECHANICAL ACCESS. REFER TO MANUFACTURERS INFORMATION. MAINTAIN ALL REQUIRED CLEARANCES FOR ACCESS. COORDINATE WITH ALL OTHER TRADES.
5. ALL RETURN GRILLES ARE FILTER GRILLES SO FILTER SECTION NOT REQUIRED ABOVE CEILING AT UNIT.
6. TRAP CONDENSATE PIPING PER MANUFACTURERS RECOMMENDATIONS.
7. PROVIDE FLEXIBLE CONNECTION AT UNIT.
8. PROVIDE VIBRATION ISOLATION GROMMET AT UNIT SUPPORT. TYPICAL.
9. PROVIDE ALL THREAD ROD AND NEOPRENE VIBRATION ISOLATION PADS. SUPPORT FROM STRUCTURE. TYPICAL.
10. IDENTIFICATION PLACARD. THE PLACARD SHALL INCLUDE THE FOLLOWING (1) UNIT SIZE, (2) UNIQUE IDENTIFIER NUMBER, (3) SPECIFIC ROOM(S) SERVED WITH ROOM NUMBERS, (4) COMPRESSOR TYPE, (5) ELECTRIC PANEL NAME AND CIRCUIT NUMBER FEEDING THE EQUIPMENT.
11. GS/GR PIPING. REFER TO HEAT PUMP PIPING SCHEMATIC FOR DETAILS.
12. OPEN ENDED DUCT APPLIES TO MEZZANINE UNIT ONLY. DUCT SIZE EQUAL TO UNIT RETURN AIR OPENING. PROVIDE WITH METAL WIRE MESH SCREEN.
13. FLEXIBLE HOSE KITS. HOSE KITS SHALL CONTAIN 2-WAY, 2-POSITION, 3-WIRE CONTROL VALVE AND HAYES AUTOMATIC BALANCE VALVE. HOSE KITS SHALL MATCH, TRANSITION DOWN AT HEAT PUMP AS REQUIRED. REFER TO SPECIFICATIONS FOR FURTHER REQUIREMENTS.
14. HANG UNIT FROM STRUCTURE ABOVE. COORDINATE HEIGHT AND EXACT LOCATION WITH ALL OTHER TRADES.
15. MANUAL AIR VENT, TYPICAL. INSTALL IN BOTH SUPPLY AND RETURN PIPING.
16. FULL SIZE BYPASS, DO NOT CLOSE UNTIL SYSTEM HAS BEEN COMPLETELY FLUSHED.
17. PIPING TAKEOFF SHALL BE TAKEN FROM SIDE OF PIPING. REFER TO THE DETAIL ON SHEET M5.0 FOR TAKEOFF INFORMATION.
18. 2-WAY CONTROL VALVE.
19. BALANCING VALVE.

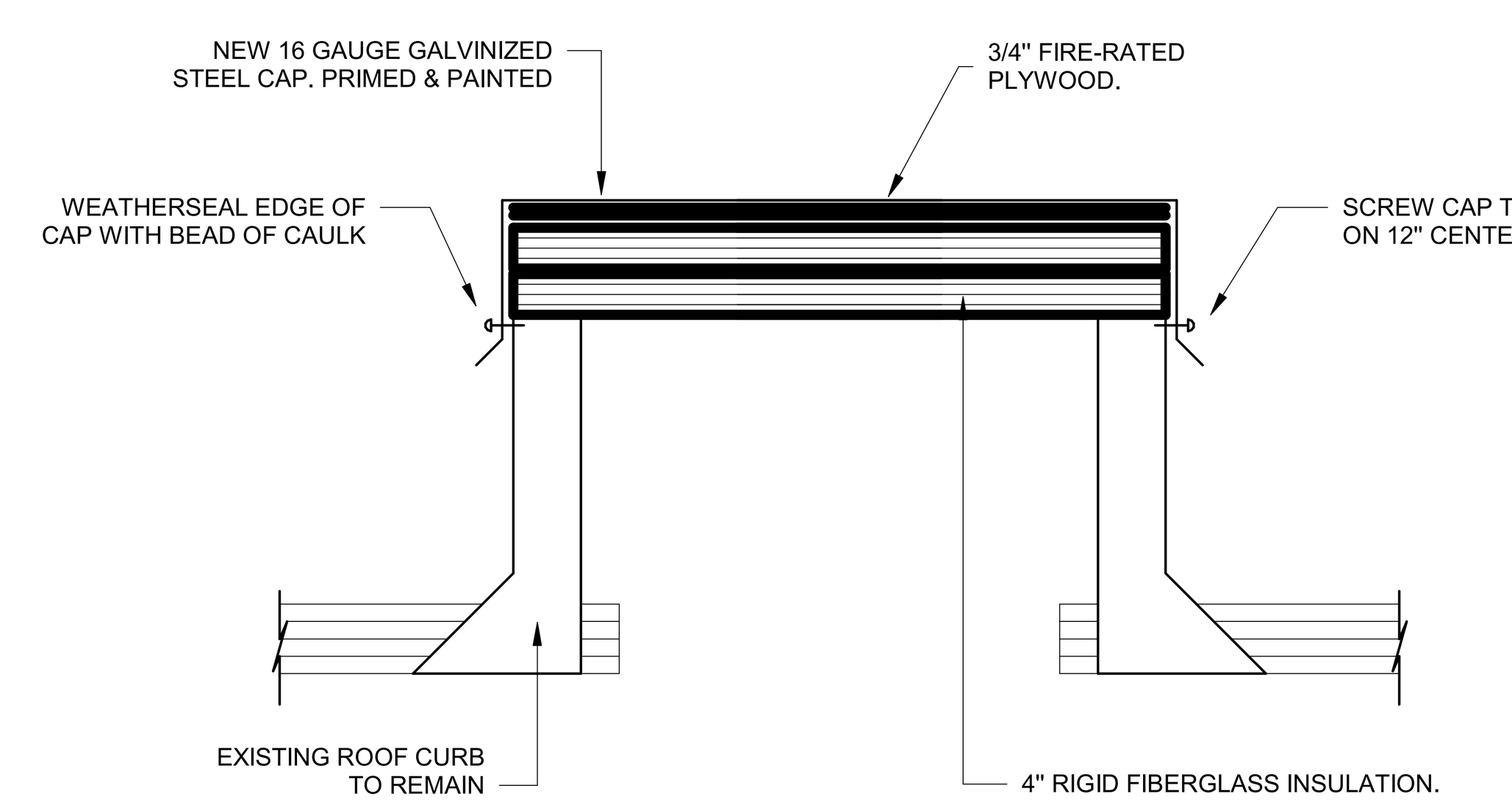
2 HORIZONTAL HEAT PUMP INSTALLATION DETAIL

NO SCALE



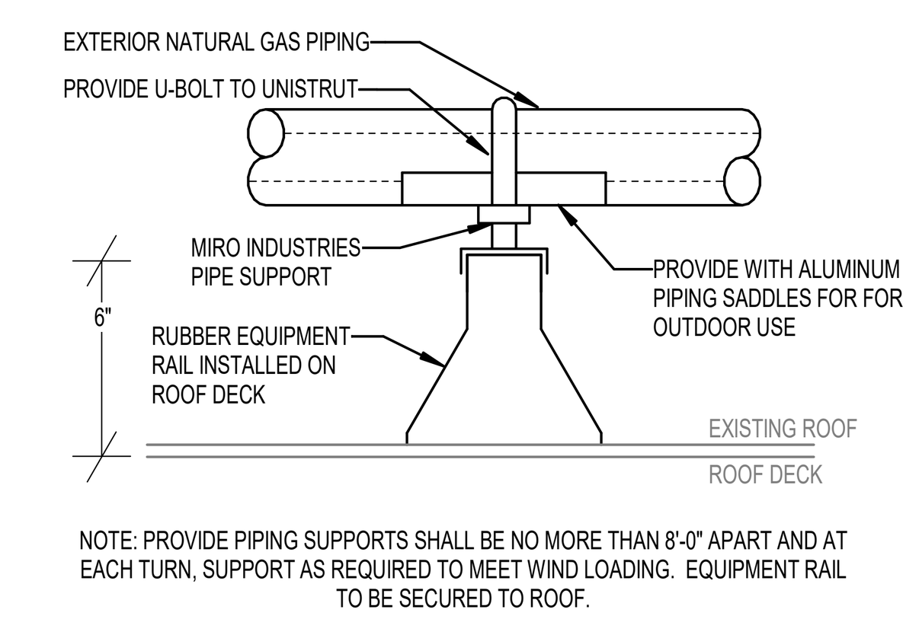
3 TYPICAL COMBUSTION AIR ROOF PENETRATION DETAIL

NO SCALE



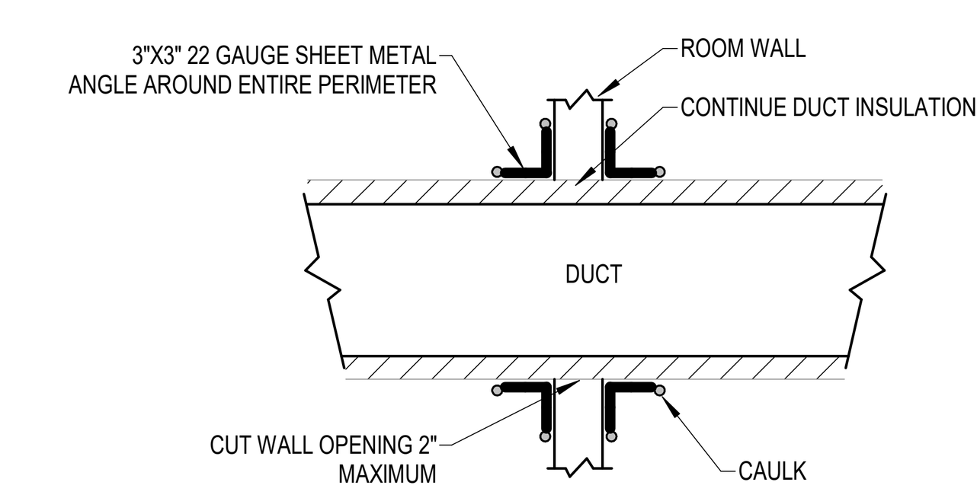
4 ROOF CURB CAP DETAIL

NO SCALE



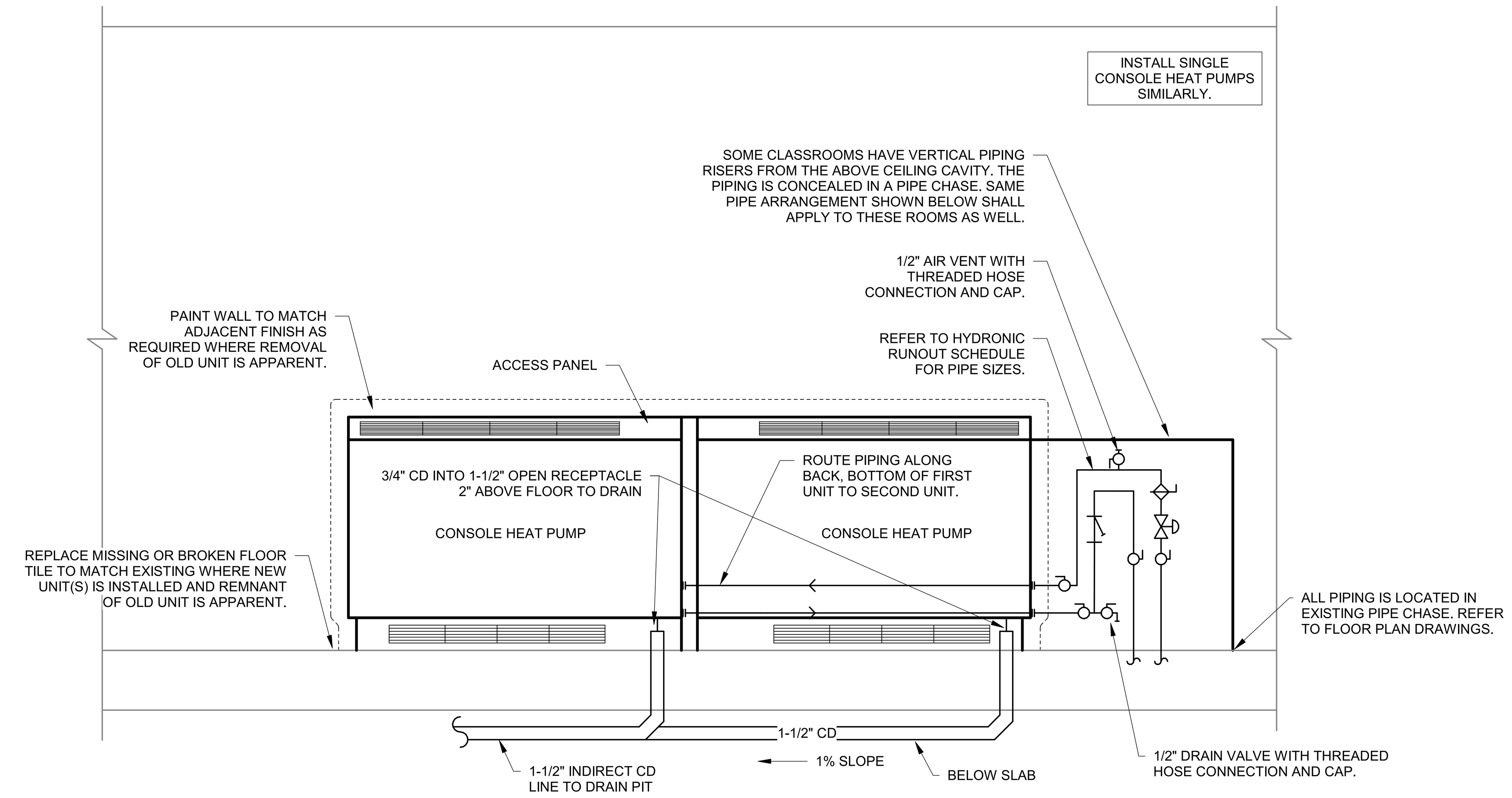
5 PIPE SUPPORT DETAIL

NO SCALE



6 DUCT WALL PENETRATION DETAIL

NO SCALE



7 CONSOLE HEAT PUMP INSTALLATION DETAIL

NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
WILLIAM EPPS, JR.
PE-19127
PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

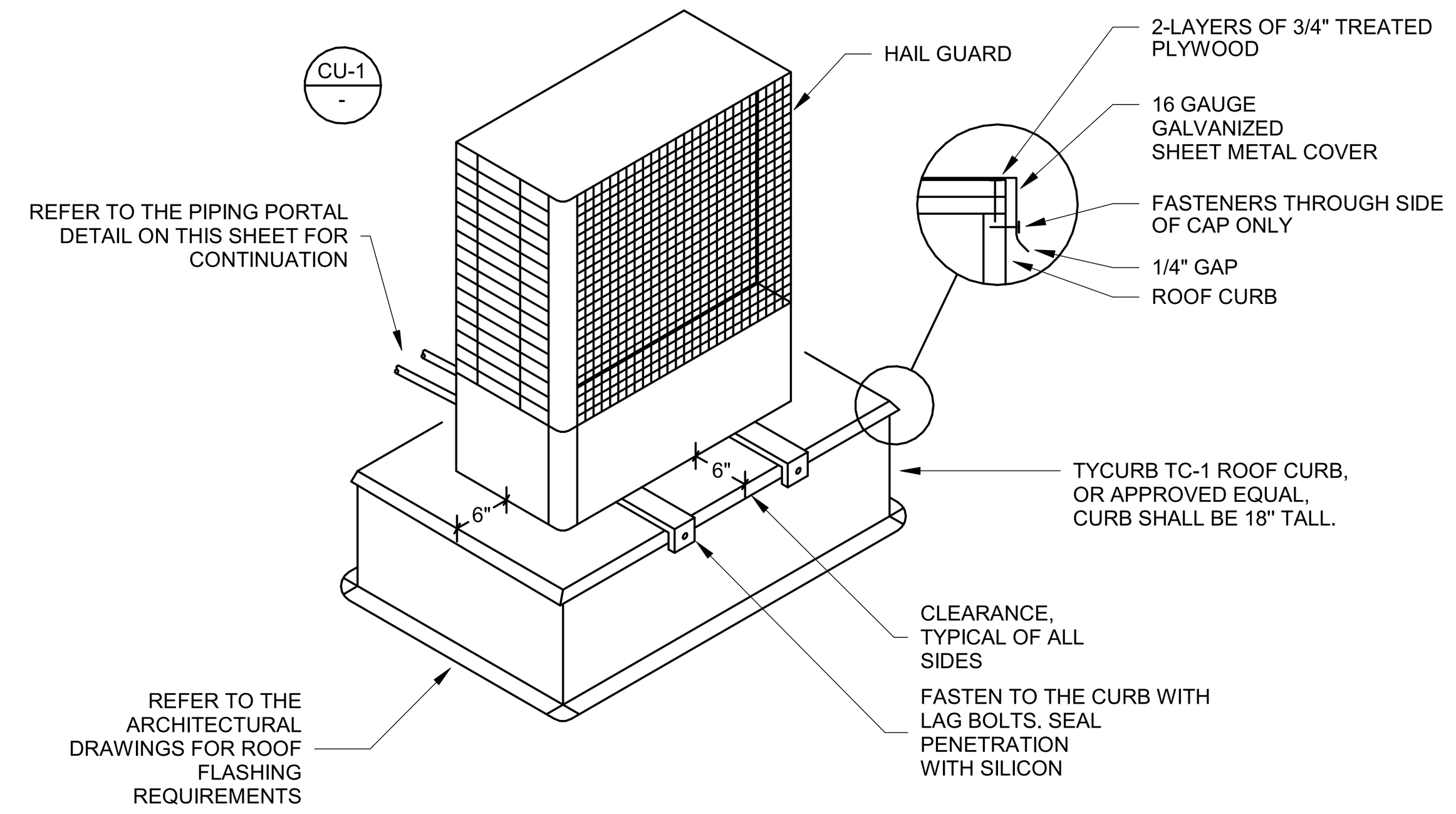
MECHANICAL DETAILS

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	ADB
CHECKED	JRE

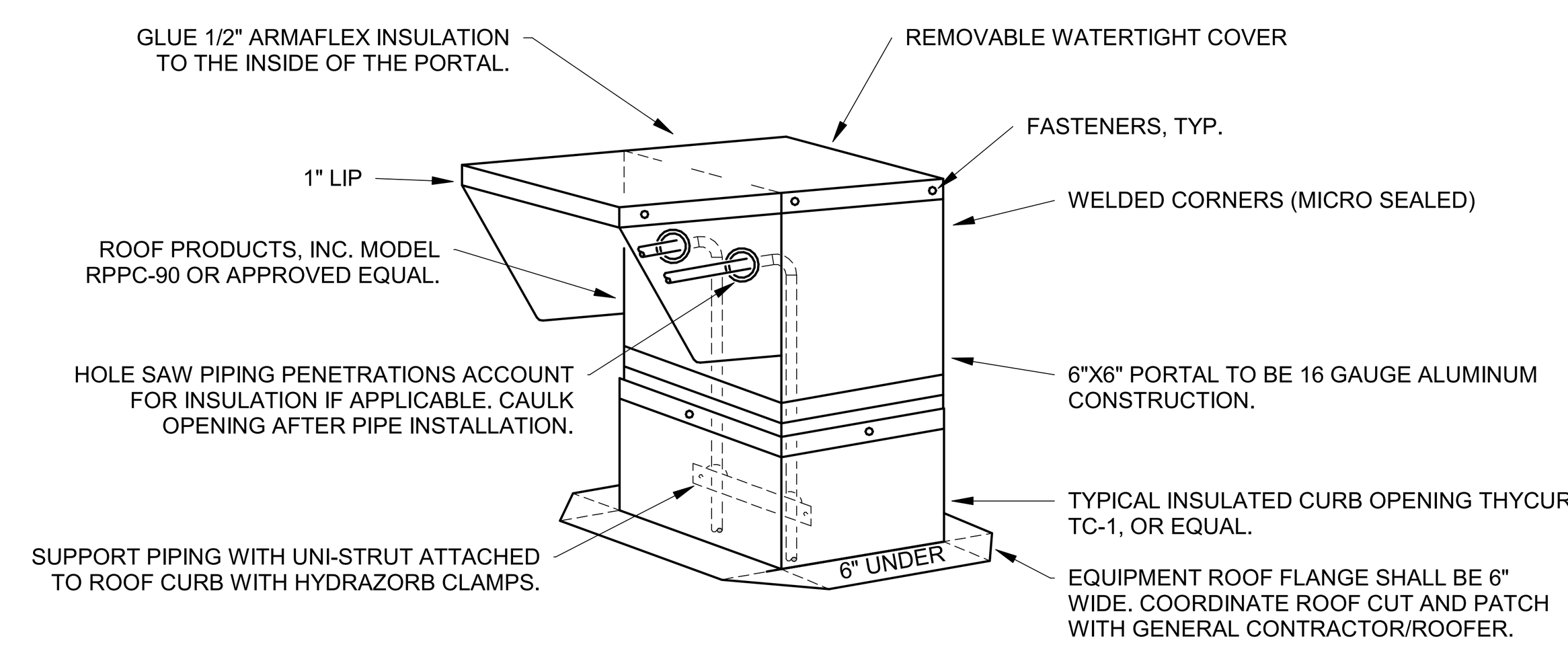
REVISIONS

No.	Description	Date

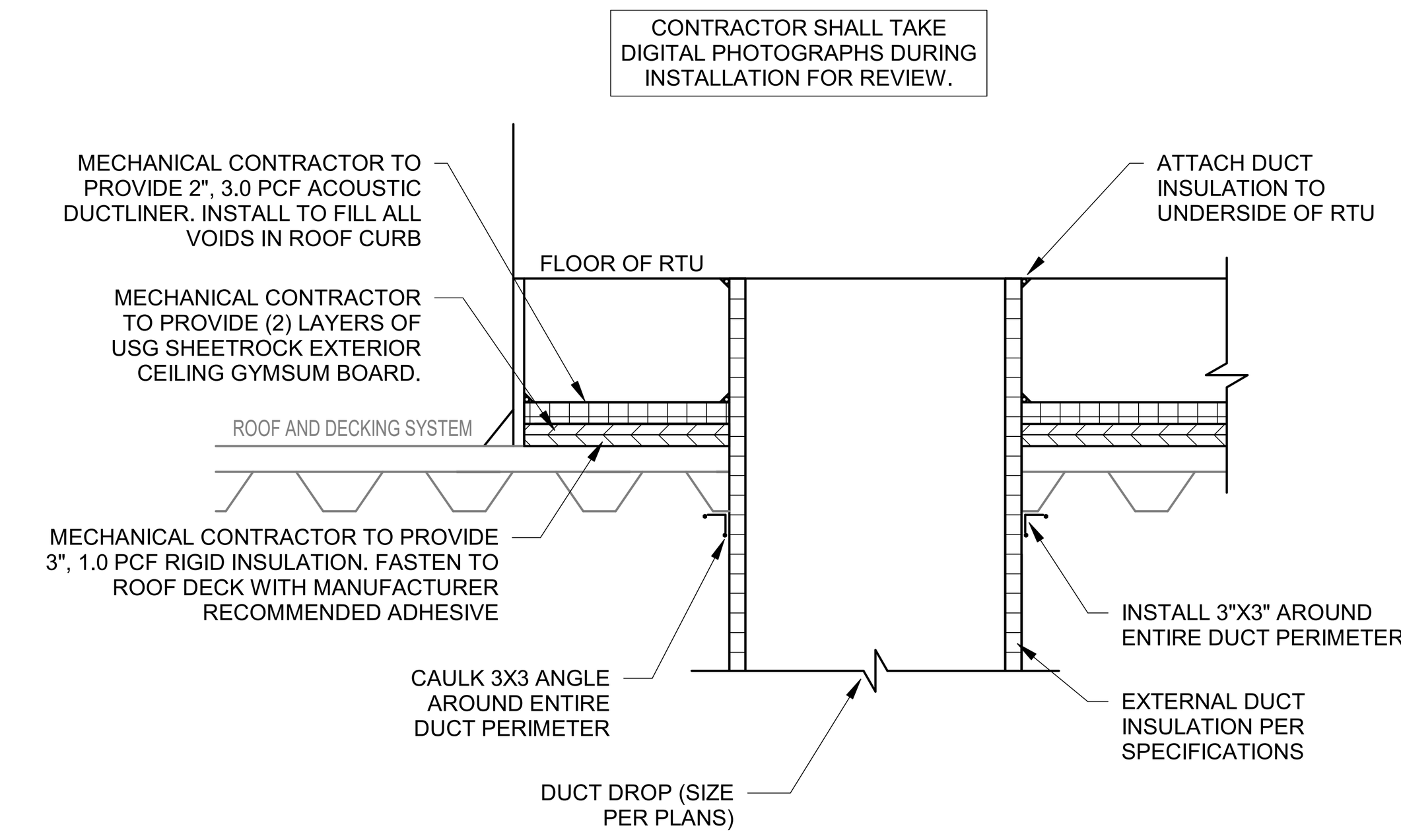
SHEET
M5.0



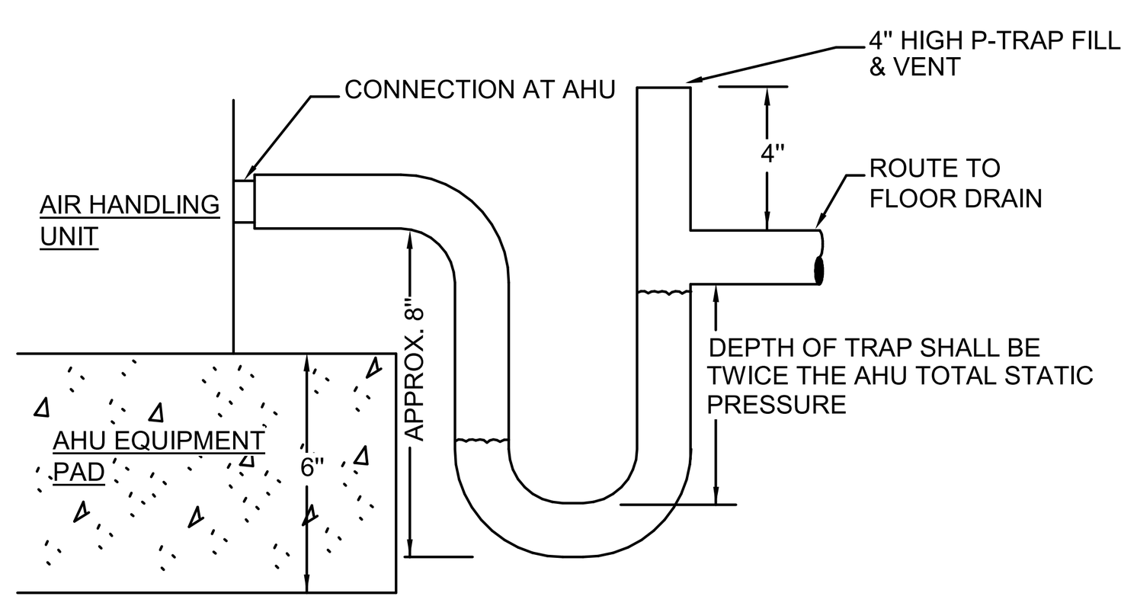
1 ROOF MOUNTED CONDENSING UNIT DETAIL
NO SCALE



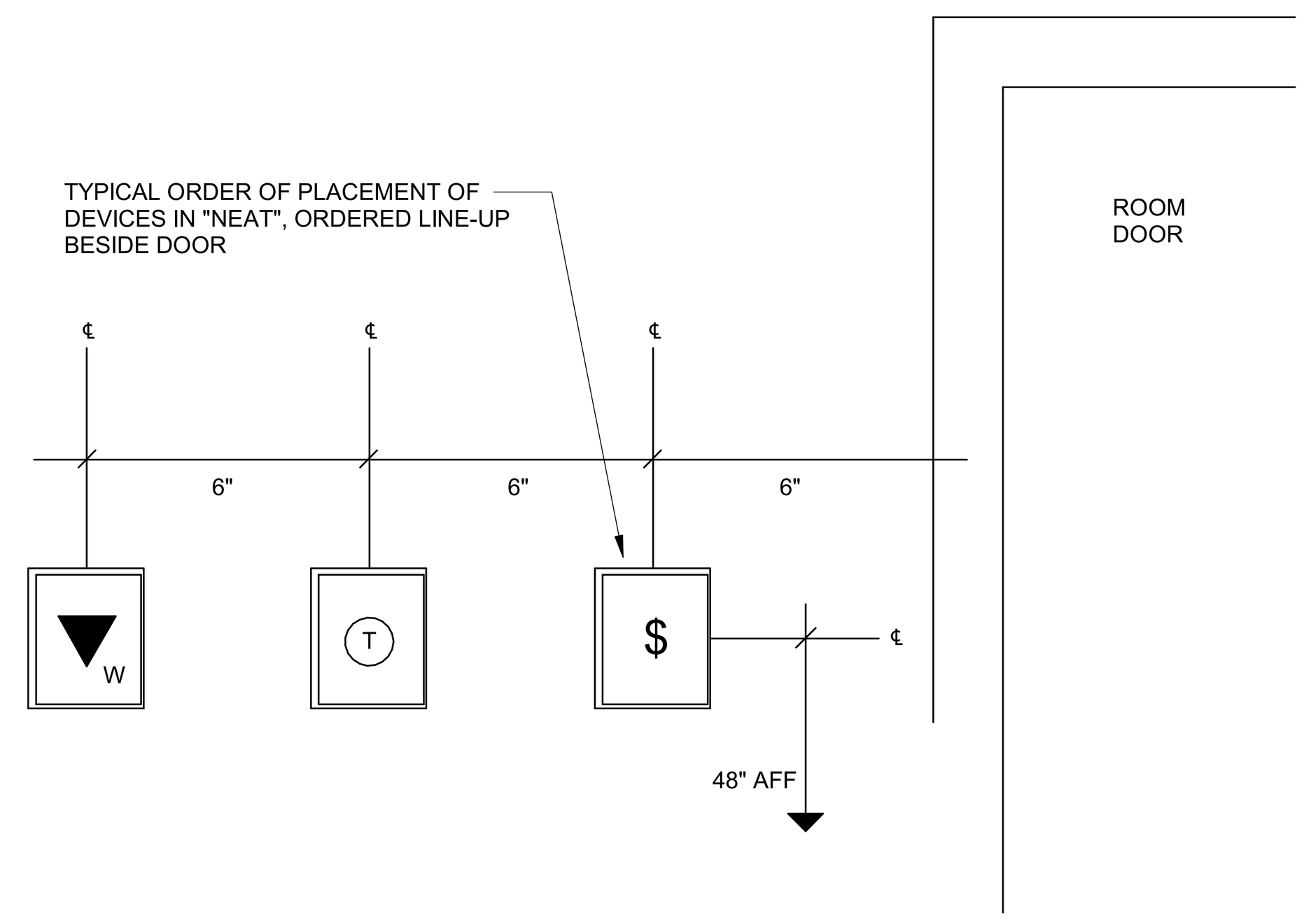
2 PIPE CHASE ROOF CURB DETAIL
NO SCALE



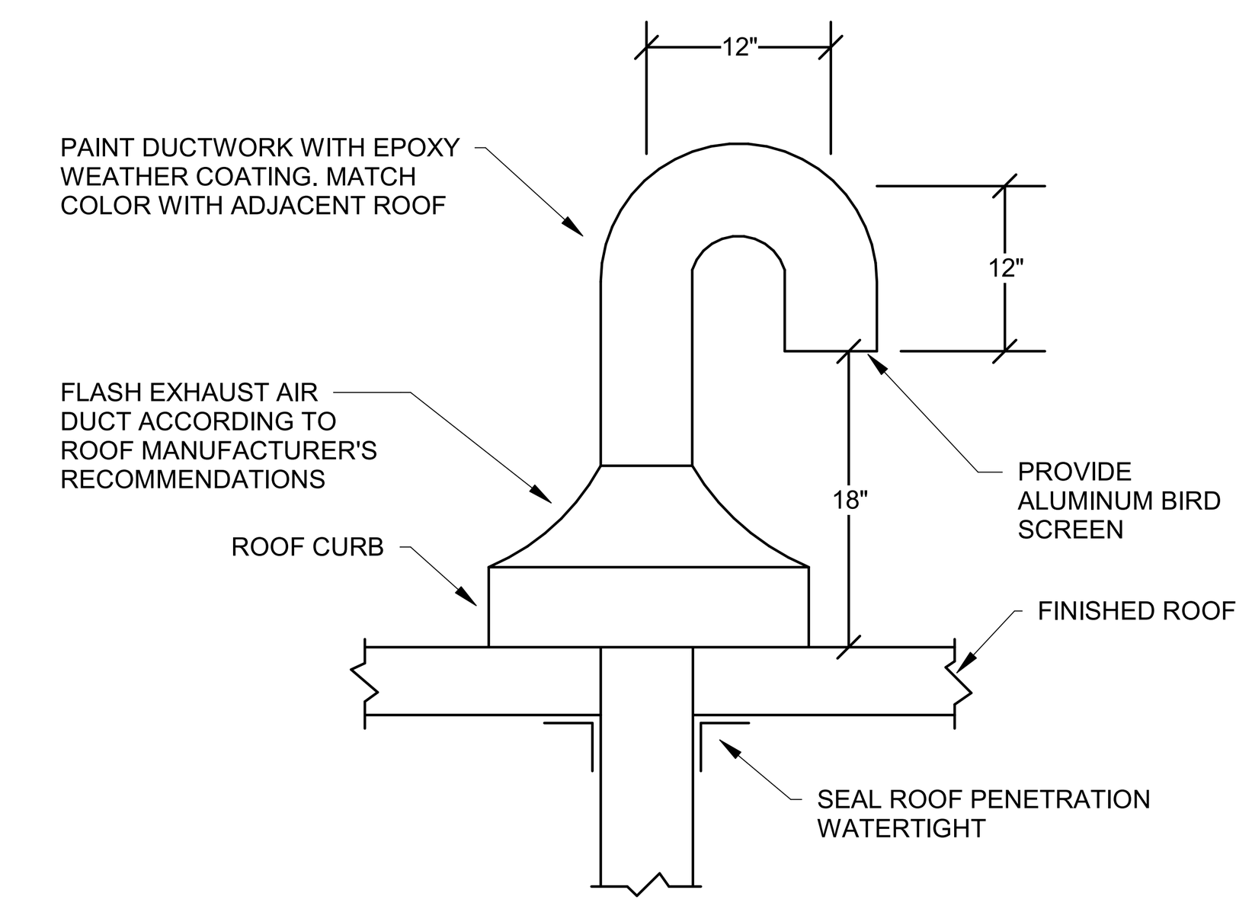
3 ACOUSTICAL TREATMENT OF RTU DETAIL
NO SCALE



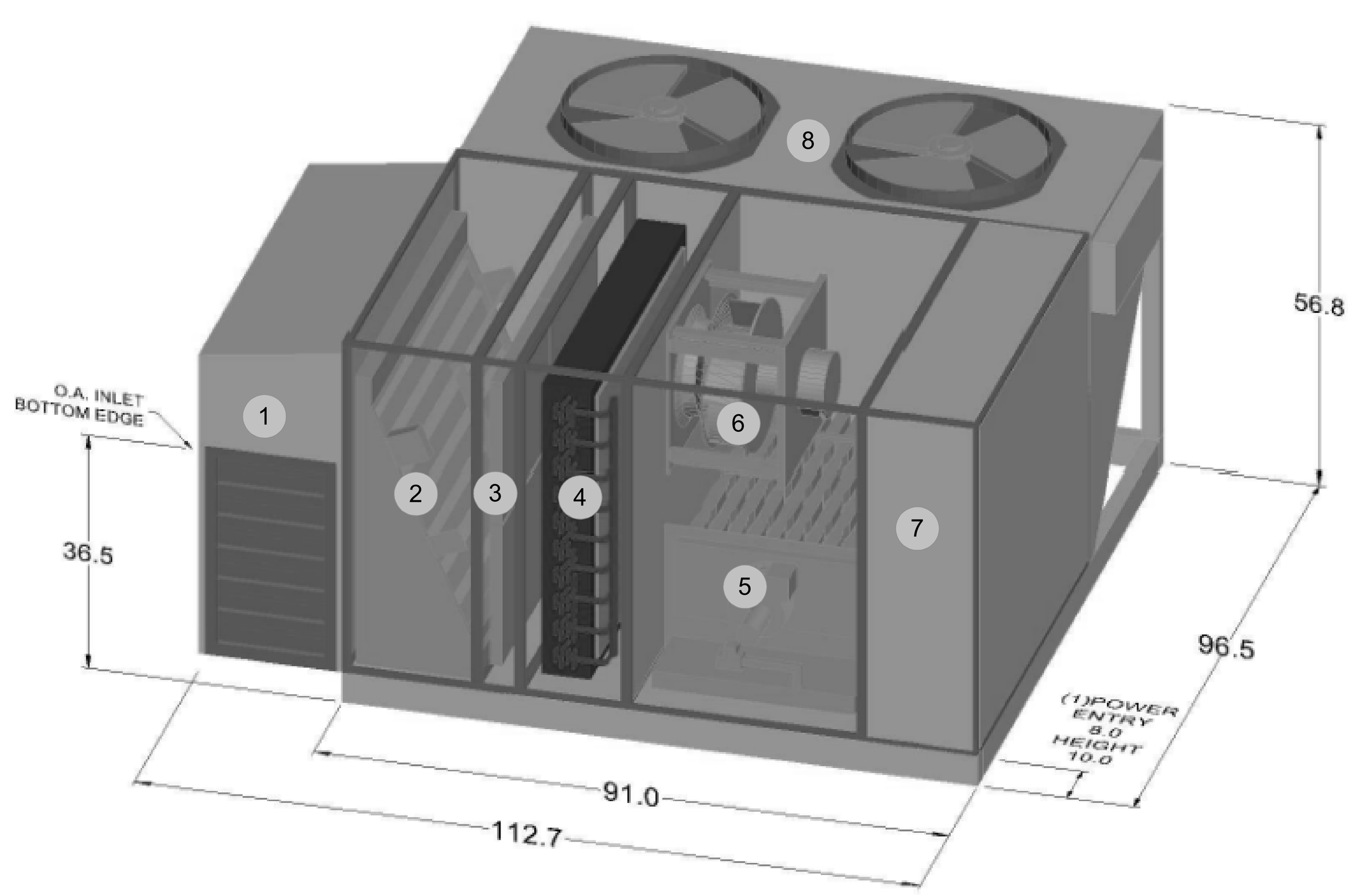
4 TYPICAL AIR HANDLER CONDENSATE DRAIN TRAP DETAIL
NO SCALE



5 WALL SENSOR DETAIL
NO SCALE



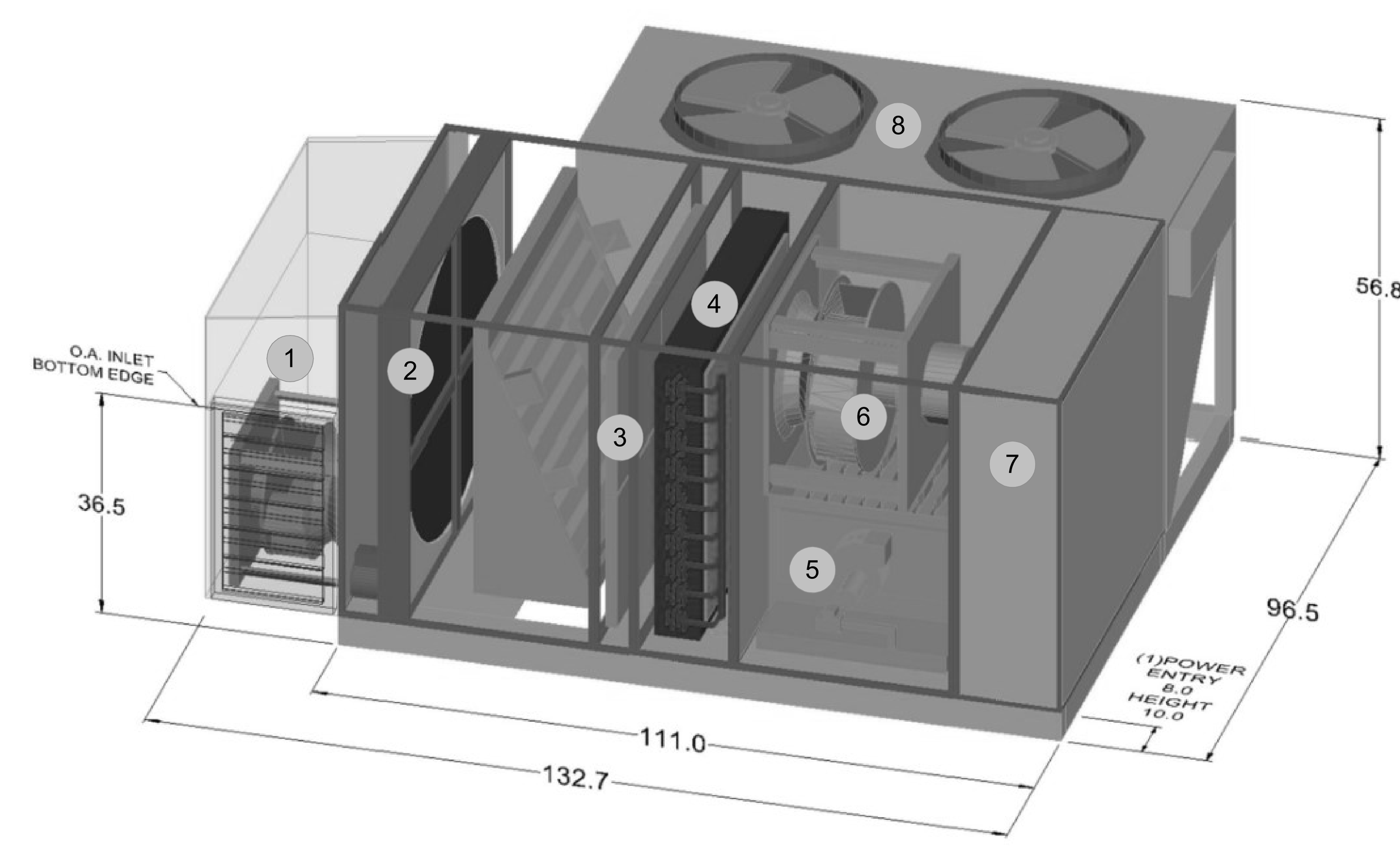
6 GOOSENECK ROOF PENETRATION DETAIL
NO SCALE



RTU-1 SECTIONS:

1. OA HOOD
2. OUTSIDE AIR SECTION
3. FILTER SECTION
4. DX COOLING COIL
5. GAS HEAT SECTION
6. SUPPLY FAN AND DISCHARGE
7. CONTROL PANEL
8. CONDENSER SECTION

7 RTU-1 CONFIGURATION
NO SCALE



RTU-2 SECTIONS:

1. OA INLET AND FAN
2. ENERGY RECOVERY WHEEL
3. FILTER SECTION
4. DX COOLING COIL
5. GAS HEAT SECTION
6. SUPPLY FAN AND DISCHARGE
7. CONTROL PANEL
8. CONDENSER SECTION

8 RTU-2 CONFIGURATION
NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY WILLIAM EPPS, JR. PE-19127 PROFESSIONAL ENGINEER

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY ADDITION AND RENOVATION
BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

MECHANICAL DETAILS

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	ADB
CHECKED	JRE

REVISIONS

No.	Description	Date

SHEET
M5.1

ROOFTOP UNIT SCHEDULE

MARK	#	MFG	MODEL	PRODUCT	LOCATION	AREA SERVED	EER (MBH/KW)	ELECTRICAL			SUPPLY FAN				EXHAUST FAN	COOLING										REFRIG.	COMP. TYPE	COMP. QTY.	GAS HEAT		FILTER					UNIT CONTROLS	SHIP WT. (LB)	OPER. WT. (LB)
								VOLT.	PH.	MCA (A)	EQUIPMENT NOMINAL (CFM)	FAN TYPE	ESP (IN-WG)	MOTOR VFD	AIRFLOW (CFM)	TOT. CAP. (BTU/H)	SENS. CAP. (BTU/H)	EAT DB (°F)	EAT WB (°F)	LAT DB (°F)	LAT WB (°F)	ROWS	FPI	APD (IN-WG)	FACE VEL. (FPM)				INPUT POWER (BTU/H)	TURN DOWN	DESCRIPTION	FACE AREA (SF)	SIZE	APD (IN-WG)	MERV			
RTU	1	DAIKIN APPLIED	DPS007	REBEL	KITCHEN	KITCHEN	12.1	208	3	39	3000	SWSI AF	2.00	Yes	2000	90047	73347	76	64	54	54	3	15	0.14	214	R410A	Scroll	2	200000	5:1 turndown	Combo 2 in./4 in. rack with 2 in. MERV 8 in.	18.0	18 x 24 x 2	0.05	MERV 8	Variable Air Volume, Single Zone (Mixed Air or 100% OA)	2182	2182
RTU	2	DAIKIN APPLIED	DPS010	REBEL W/ERW	CAFETERIA	CAFETERIA	12.1	208	3	62	4000	SWSI AF	2.00	Yes	2350	118473	94581	76	64	54	54	4	15	0.25	259	R410A	Scroll	2	200000	5:1 turndown	Combo 2 in./4 in. rack with 2 in. MERV 8 in.	18.0	18 x 24 x 2	0.10	MERV 8	Variable Air Volume, Single Zone (Mixed Air or 100% OA)	2657	2657

REMARKS:
1. PROVIDE FACTORY START-UP UTILIZING MANUFACTURERS STANDARD FORMS.
2. PROVIDE NON-FUSED DISCONNECT AND SINGLE POINT POWER CONNECTION.
3. PROVIDE R410A DIGITAL SCORLL COMPRESSORS.
4. PROVIDE 24" INSULATED ROOF CURB.
5. PROVIDE TWO POSITION OA, RA, AND EA DAMPERS.
6. PROVIDE OUTSIDE AND EXHAUST AIRFLOW MONITORING.
7. PROVIDE UNIT WITH FACTORY CONTROLS WITH BACNET/MSTP INTERFACE GATEWAY.
8. THE RTU SHALL INCLUDE PROVISIONS FOR SHUTDOWN UPON ACTIVATION OF EITHER FIRE ALARM OR THE DUCT SMOKE DETECTOR (IF PRESENT). COORDINATE WITH THE CONTROLS CONTRACTOR. FIRE ALARM CABLING SHALL BE PULLED BY THE ELECTRICAL CONTRACTOR AND BE TERMINATED BY THE CONTROLS CONTRACTOR.
9. SUPPLY STAINLESS STEEL CONDENSATE DRAIN PAN. ENTIRE PAN SHALL BE PITCHED TO OUTLET.
10. PROVIDE A CONDENSATE TRAP SIZED AND INSTALLED PER THE MANUFACTURERS RECOMMENDATIONS.
11. ANY UNIT EXCEEDING THE LISTED DIMENSIONS OR WEIGHTS SHALL BE SUBMITTED FOR REVIEW AND APPROVED BY THE ENGINEER.
12. PROVIDE ALL UNITS WITH HAIL GUARD.
13. PROVIDE UNITS WITH 0-100% MODULATING HOT GAS REHEAT.
14. PROVIDE ECM CONDENSER FANS.
15. PROVIDE MODULATING HEAD PRESSURE CONTROL.
16. COORDINATE FINAL MOTOR LOAD REQUIREMENTS WITH ELECTRCAL CONTRACTOR.

REGISTERS, GRILLES, AND DIFFUSERS SCHEDULE

MARK	MANUFACTURER	MODEL #	TYPE	GRILLE SIZE	PANEL SIZE	DUCT INLET	CFM RANGE	REMARKS
E-1	TITUS	50F	EXTRUDED ALUMINUM FRAME W/ 1/2" CUBE CORE	24x24	6"Ø	6"Ø	0-100	1,5
E-2	TITUS	50F	EXTRUDED ALUMINUM FRAME W/ 1/2" CUBE CORE	24x24	8"Ø	8"Ø	101-225	1,5
E-5	TITUS	50F	EXTRUDED ALUMINUM FRAME W/ 1/2" CUBE CORE	12x12	6"Ø	6"Ø	0-100	1,5
R-1	TITUS	50F	EXTRUDED ALUMINUM FRAME W/ 1/2" CUBE CORE	24x24	6"Ø	6"Ø	0-100	1,5
R-2	TITUS	50F	EXTRUDED ALUMINUM FRAME W/ 1/2" CUBE CORE	24x24	8"Ø	8"Ø	101-225	1,5
R-4	TITUS	50F	EXTRUDED ALUMINUM FRAME W/ 1/2" CUBE CORE	24x24	12"Ø	12"Ø	351-600	1,5
S-1	TITUS	OMNI-AA	EXTRUDED ALUMINUM SQUARE PLAQUE FACE	24x24	6"Ø	6"Ø	0-100	1,4,5
S-2	TITUS	OMNI-AA	EXTRUDED ALUMINUM SQUARE PLAQUE FACE	24x24	8"Ø	8"Ø	101-225	1,4,5
S-3	TITUS	OMNI-AA	EXTRUDED ALUMINUM SQUARE PLAQUE FACE	24x24	10"Ø	10"Ø	226-350	1,4,5
S-4	TITUS	OMNI-AA	EXTRUDED ALUMINUM SQUARE PLAQUE FACE	24x24	12"Ø	12"Ø	351-600	1,4,5

REMARKS:
1. CEILING T-BAR MOUNTED IN 24" X 24" ALUMINUM PANEL OR DRYWALL MOUNTED. REFER TO ON SITE CONDITIONS FOR CEILING TYPES.
2. SIDEWALL OR DUCT MOUNTED.
3. PROVIDE GRILLE WITHOUT 24" X 24" ALUMINUM PANEL.
4. PROVIDE WITH FACTORY INSULATED PLENUM.
5. WHITE IN COLOR.
6. COLOR SHALL BE SELECTED BY PROJECT ENGINEER.

MAKE-UP AIR UNIT SCHEDULE

MARK	#	MFG	MODEL	CFM	ESP	HP	RPM	ELECTRICAL					HEATING CAPACITY			WEIGHT (LBS)
								VOLT.	PH	FLA	MCA	MOCP	GAS INPUT (MBH)	GAS OUTPUT (MBH)	GAS INLET PRESSURE (IN. WC)	
MAU	1	K-TECH	K-A2-D.250-20D	2432 CFM	0.80 in-wg	2.00	1201	208 V	1	16 A	19 A	30 A	165391	152160	7 IN. W.C. - 14 IN. W.C.	656

REMARKS:
1. ALL COMPONENTS OF THE MAKEUP AIR UNIT SHALL BE UL LISTED.
2. PROVIDE WEATHERPROOF DISCONNECT SWITCH.
3. PROVIDE MAKEUP AIR UNIT WITH DISCHARGE AIR TEMPERATURE CONTROL.
4. PROVIDE A FULL PERIMETER AND INSULATED BOTTOM FOR GRADE INSTALLATION ON STRUCTURAL FRAME.
5. PROVIDE WITH MOTORIZED BACKDRAFT DAMPER IN INTAKE OF UNIT INTERLOCKED TO OPEN WITH SUPPLY FAN. DAMPER SHALL HAVE SEALS.
6. PROVIDE WITH FILTER.
7. ACCEPTABLE MANUFACTURERS: K-TECH, DUOAIRE, TRANE, REZNOR, GREENHECK.

KITCHEN HOOD SCHEDULE

MARK	#	MFG	MODEL	LENGTH	MOUNTING HEIGHT	TYPE	EXHAUST CFM	SUPPLY CFM	WEIGHT (LBS)
KH	1	K-TECH	7224 PK-ND-2 Q-SB-F	10' 8"	80"	CLASS 1	1867	1568	611
KH	2	K-TECH	7224 PK-ND-2 Q-SB-F	6' 0"	80"	CLASS 1	1080	864	375

REMARKS:
1. TYPE I HOOD SHALL BE CONSTRUCTED OF 18 GA SS WELDED CONSTRUCTION WITH FULL LENGTH REMOVABLE CONDENSATE BAFFLE. HOOD SHALL INCLUDE A FULL PERIMETER, WELDED, FILTERS, CONDENSATE COLLECTING GUTTER. PROVIDE WITH DUCT COLLAR CONNECTIONS.
2. PROVIDE STAINLESS STEEL FIELD WRAPPER INSTALLED FROM TOP OF HOOD TO ABOVE CEILING.
3. PROVIDE STAINLESS STEEL VERTICAL OR WALL END PANELS ON RIGHT AND LEFT SIDE OF HOOD.
4. PROVIDE WITH WALL UTILITY CABINET WITH HOOD SUPPRESSION FIRE SYSTEM. EXTEND PIPING FROM WALL CABINET TO HOOD PER VENDOR REQUIREMENTS FOR A COMPLETE FUNCTIONAL FP HOOD SYSTEM.
5. HOOD MOUNTED CONTROL PANEL FOR HOOD FAN AND LIGHTS.
6. ACCEPTABLE MANUFACTURERS: K-TECH, GREENHECK, CAPTIVE-AIRE OR HALTON.

EXHAUST FAN SCHEDULE

MARK	#	MFG	MODEL	SERVICE	TYPE	AIRFLOW (CFM)	E.S.P.	DRIVE	RPM	FAN HP	BHP	ELECTRICAL DATA			SONES	WEIGHT (LBS)	REMARKS
												VOLTAGE	PHASE	HZ			
DEF	1	K-TECH	DU33HK	DISHWASHER	ROOF MOUNTED - UPBLAST	1000 CFM	0.25	DIRECT	1623	1/3	0.2840	115 V	1	60	18.2	68	1,2,6,7,8,9,10,11
EF	1	GREENHECK	SP-B90	RESTROOM - 160	CEILING EXHAUST FAN	75 CFM	0.13	DIRECT	700	1/8	-	120 V	1	60	1	10	1,2,3,4,5,8,11
EF	2	GREENHECK	G-070G	RESTROOM - 169, STAFF - 170	ROOF MOUNTED - UPBLAST	250 CFM	0.13	DIRECT	1300	1/60	0.02	120 V	1	60	3.3	15	1,2,6,7,8,9,11
EF	3	GREENHECK	G-070G	CAFETERIA RESTROOMS	ROOF MOUNTED - UPBLAST	250 CFM	0.13	DIRECT	1300	1/60	0.02	120 V	1	60	3.3	15	1,2,6,7,8,9,11
EF	4	GREENHECK	SP-B90	JANITOR - 154	CEILING EXHAUST FAN	75 CFM	0.13	DIRECT	700	1/8	-	120 V	1	60	1	10	1,2,3,4,5,8,11
KEF	1	K-TECH	DU180HK	KITCHEN HOODS	ROOF MOUNTED - UPBLAST	2947 CFM	1.75	DIRECT	1332	3	1.7990	208 V	3	60	19.2	185	1,2,6,7,8,9,10,11

REMARKS:
1. PROVIDE FAN WITH INTEGRAL DISCONNECT.
2. ALL EXHAUST FANS SHALL BE UL LISTED.
3. PROVIDE CEILING EXHAUST FAN WITH WALL MOUNTED SPEED CONTROLLER. CONTROL SWITCH SHALL BE INSTALLED BY TCC.
4. PROVIDE CEILING EXHAUST FAN WITH INTERAL BACKDRAFT DAMPER.
5. PROVIDE FAN WITH INTEGRAL LIGHT AND SWITCH.
6. PROVIDE FAN WITH HINGED INSULATED CURB.
7. PROVIDE NEW ROOF CURB.
8. COORDINATE FINAL MOTOR LOAD REQUIREMENTS WITH ELECTRICAL CONTRACTOR.
9. PROVIDE FAN WITH BIRD SCREEN.
10. PROVIDE WITH GREASE COLLECTOR AND HINGED TOP.
11. ACCEPTABLE MANUFACTURERS: GREENHECK, LOREN COOK, TWIN CITY, K-TECH.

HEAT PUMP SCHEDULE

MARK	#	MFG	MODEL	TYPE	NOM. CFM	ESP (IN WG.)	FAN	GPM	WATER PD (FT. H20)	COMPRESSORS	STAGES	REFRIGERANT	WEIGHT (LBS)	ELECTRICAL					REVERSE CYCLE HEATING CAPACITY - 70F EAT, 50F EWT			COOLING CAPACITY - 74F / 62F, 85F EWT			
														VOLTS	Hz	PH	MCA	MOCP	HEATING CAPACITY (MBH)	HEAT OF ABSORBTION (MBH) (FULL)	COP @ ARI (FULL)	SENSIBLE COOLING (MBH)	TOTAL CAPACITY (MBH) (FULL)	HEAT OF REJECTION (MBH)	EER @ ARI
CHP	015	WATERFURNACE	NCS15	CONSOLE	600	0.10	ECM	3.5	10.00	1	1	R-410A	230	208 V	60	1	10 A	15 A	14.9	11.6	4.5	12.1	13.7	17.4	12.4
HHP	024	WATERFURNACE	NBH026	HORIZONTAL	800	0.70	ECM	6.0	6.00	1	2	R-410A	325	208 V	60	3	12 A	15 A	24.9	19.5	4.6	18.4	26.0	31.3	16.7

REMARKS:
1. PROVIDE UNITS WITH INTEGRAL DISCONNECT. IF MANUFACTURER CANNOT ACCOMODATE, A DISCONNECT SHALL BE PROVIDED AS REQUIRED. ELECTRICAL CONTRACTOR SHALL FURNISH DISCONNECTS FOR 6 TON OR LARGER HEAT PUMPS. RE-USE EXISTING FUSED DISCONNECTS WHERE POSSIBLE.
2. PROVIDE UNITS WITH CONDENSATE OVERFLOW SWITCH.
3. PROVIDE SOUND KITS AND COMPRESSOR ACOUSTIC BLANKET FOR HORIZONTAL AND VERTICAL HEAT PUMPS.
4. PROVIDE UNITS WITH VARIABLE SPEED ECM WHERE POSSIBLE.
5. PROVIDE HIGH STATIC FANS FOR ALL APPLICABLE HEAT PUMPS.
6. COORDINATE LEFT-HAND/RIGHT-HAND AND STRAIGHT-THROUGH/END DISCHARGE CONFIGURATIONS FOR ALL UNITS PRIOR TO ORDERING.
7. PROVIDE UNIT STAND AS NECESSARY TO ALLOW FOR PROPER INSTALLATION OF CONDENSATE P-TRAP.
8. REUSE EXISTING UNITS WHERE NOTED ON PLANS.

DUCTLESS SPLIT SYSTEM SCHEDULE

MARK	#	MANUFACTURER	MODEL	SERVICE	CONFIGURATION	FAN CFM	NOMINAL COOLING CAPACITY	SENSIBLE COOLING CAPACITY	NOMINAL HEATING CAPACITY	SEER	ELECTRICAL				WEIGHT (LBS)
											VOLTAGE	PHASE	MCA	HSPF	
AHU	1	DAIKIN	FFQ12Q2VJU	DRY FOOD STORAGE - 172	CEILING MOUNTED	125 CFM	10800.0 Btu/h	8430.0 Btu/h	13500.0 Btu/h	20.90	208 V	1	9 A	11.70	36
CU	1	DAIKIN	RX12QMVJU	DRY FOOD STORAGE - 172	ROOF MOUNTED		10800.0 Btu/h		13500.0 Btu/h	18.00	208 V	1	9 A	11.20	60

REMARKS:
1. COOLING CAPACITY BASED ON: 80°F / 67°F (DB / WB) INDOOR; 95°F / 75°F (DB / WB) OUTDOOR.
2. HEATING CAPACITY BASED ON: 70°F / 60°F (DB / WB) INDOOR; 17°F / 15°F (DB / WB) OUTDOOR.
3. SPLIT SYSTEMS SHALL USE R-410A REFRIGERANT. LOW AMBIENT COOLING TO 0° OUTDOOR AIR TEMPERATURE.
4. PROVIDE CONDENSATE PUMP EQUAL TO BLUE DIAMON "MAXIBLUE". ELECTRICAL CONTRACTOR SHALL PROVIDE SEPARATE 120 VOLT POWER FOR PUMP.
5. DISCONNECT FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR.
6. ACCEPTABLE MANUFACTURERS: DAIKIN, MITSUBISHI, SANYO AND FRIEDRICH.

DOOR AIR CURTAIN SCHEDULE

MARK	#	MANUFACTURER	MODEL	SERVICE	CONFIGURATION	DIMENSIONS (IN.)			FAN CFM	HEATING CAPACITY (kW)	ELECTRICAL				WEIGHT (LBS)
						LENGTH	DEPTH	HEIGHT			MOTOR HP	VOLTAGE	PHASE	MCA	
DAC	1	MARS	LPV260-1E	KITCHEN AIR CURTAIN	WALL MOUNTED	60	12	8	800 CFM	9.5	1/6	208 V	1	46 A	50

REMARKS:
1. LOW PROFILE UNIT MOUNTED BELOW LAY IN CEILING.
2. PROVIDE TRANSFORMER FOR DDC THERMOSTAT, FAN SPEED CONTROLLER, INTEGRAL SUPPLY REGISTER AND ARCHITECTURAL RETURN FRILL WITH FILTER. CABINET COLOR TO BE DETERMINED BY ARCHITECT.
3. DISCONNECT BY ELECTRICAL CONTRACTOR.
4. ACCEPTABLE MANUFACTURERS: MARS, MARKEL, REZNOR AND QMARK.

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
WILLIAM EPPS, JR.
PE-19127
REGISTERED PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company
10411 Meeting Street | Louisville, KY 40059 | 502.326.3085 | cmta.com

LEGRANDE ELEMENTARY ADDITION AND RENOVATION
BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

MECHANICAL SCHEDULES

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	ADB
CHECKED	JRE

REVISIONS

No.	Description	Date

SHEET
M6.0

GENERAL NOTES (LEGEND):

A. ADDITIONAL ELECTRICAL REQUIREMENTS MAY BE SHOWN ON PLANS FROM OTHER DISCIPLINES IN THIS SET. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REVIEW ALL PLANS AND SPECIFICATIONS FOR A COMPLETE UNDERSTANDING OF THE PROJECT REQUIREMENTS.
B. WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF ALL LOCAL, STATE, AND NATIONAL CODES. INCLUDING BUT NOT LIMITED TO NFPA 70 (NEC), NFPA 72, INTERNATIONAL BUILDING CODES, ETC.
C. CONTRACTOR SHALL FOLLOW SEISMIC RESTRAINT AND DESIGN REQUIREMENTS CONTAINED IN LATEST ADOPTED STATE AND INTERNATIONAL BUILDING CODES, WITH ALL AMENDMENTS AS ADOPTED BY THE CURRENT LEGISLATION. REFER TO ELECTRICAL AND STRUCTURAL SPECIFICATIONS FOR ADDITIONAL INFORMATION.
D. ALL OFFSETS, TURNS, FITTINGS, TRIM, DETAIL, ETC. MAY NOT BE INDICATED, BUT SHALL BE PROVIDED AS REQUIRED. ADDITIONAL ALLOWANCES SHALL BE INCLUDED FOR SAME AT EACH PROPOSER'S DISCRETION.
E. INSTALL NO PIPING, CONDUIT, DUCTWORK, ETC. IN A LOCATION OR IN A MANNER WHICH WILL ALLOW FREEZING OR THE COLLECTION OF CONDENSATION THEREON. IF IN DOUBT, CONTACT THE ENGINEER.
F. ADVISE THE ENGINEER OF ANY CONFLICTS, ERRORS, OMISSIONS, ETC. AT LEAST TEN DAYS PRIOR TO BID DATE, TO ALLOW CLARIFICATION BY WRITTEN ADDENDUM.
G. WHERE CONFLICTS ARE FOUND BETWEEN DRAWINGS, DETAILS, OR SPECIFICATIONS, THE MORE STRINGENT REQUIREMENT SHALL APPLY. NOTIFY ARCHITECT OF DISCREPANCY IN WRITING.
H. DEVIATION FROM SPECIFICATIONS OR PLANS REQUIRES PRIOR WRITTEN APPROVAL FROM THE ENGINEERS AND MUST BE SUBMITTED IN WRITING NO LATER THAN TEN DAYS PRIOR TO THE BID DATE.
I. OBSERVE ALL APPLICABLE CODES, RULES AND REGULATIONS THAT MAY APPLY TO THE WORK UNDER THIS CONTRACT. (CITY, COUNTY, LOCAL, STATE, FEDERAL, MUNICIPALITY, UTILITY COMPANY, OSHA, ETC.).
J. MOUNTING HEIGHTS FOR WALL MOUNTED DEVICES INDICATED ABOVE FINISHED FLOOR ARE TO CENTER OF DEVICE UNO. MOUNTING HEIGHTS TO CEILING SUSPENDED DEVICES ARE TO BOTTOM OF DEVICE UNO.
K. INSTALL EQUIPMENT, MATERIALS, ETC. IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND DIRECTIONS. IF IN CONFLICT WITH THE DESIGN INDICATED IN CONTRACT DOCUMENTS, ADVISE THE ENGINEER PRIOR TO INSTALLATION FOR CLARIFICATION.
L. DO NOT RECESS PANELBOARD TUBS OR OTHER FLUSH-MOUNTED EQUIPMENT IN WALLS THAT HAVE A FIRE RATING. NO INSTALLATION SHALL DIMINISH OR VOID FIRE RESISTIVE RATINGS IN ANYWAY.
M. THE PURPOSE AND INTENT OF ALL OF THE DOCUMENTS PERTAINING TO THIS PROJECT IS TO PROVIDE A COMPLETE, FUNCTIONAL, SAFE, LIKE-NEW FACILITY. ANYTHING LESS SHALL BE UNACCEPTABLE.
N. ALL SYSTEMS, EQUIPMENT AND MATERIALS ARE TO BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER. WORK NOT MEETING THIS CRITERION SHALL BE REMOVED AND REINSTALLED SATISFACTORILY. FINAL DETERMINATION OF THE ACCEPTABILITY OF THE QUALITY OF WORK RESIDES WITH THE ENGINEER
O. ALL WORK, MATERIALS, EQUIPMENT, ETC. SHALL BE FULLY GUARANTEED FOR ONE FULL CALENDAR YEAR FROM THE DATE OF SUBSTANTIAL COMPLETION AS DOCUMENTED BY THE ENGINEER, UNLESS LONGER WARRANTY PERIODS FOR EQUIPMENT ARE SPECIFIED.
P. UNLESS OTHERWISE SPECIFIED OR INDICATED, ALL EQUIPMENT AND/OR MATERIALS WITHIN OCCUPIED SPACES OR EXPOSED TO VIEW ON THE BUILDING EXTERIOR SHALL BE PRIMED AND FINISHED SO AS TO COMPLEMENT ADJACENT SURFACE, UNLESS OTHERWISE NOTED. COORDINATE WORK AND COLORS WITH ARCHITECT.
Q. WHERE PENETRATING ROOFING MEMBRANE OR OTHER MATERIALS USED FOR WEATHERPROOFING THE BUILDING, MAKE SUCH PENETRATION IN A WAY THAT WILL NOT VOID OR DIMINISH THE ROOFING WARRANTY OR INTEGRITY IN ANYWAY. COORDINATE ALL SUCH PENETRATIONS WITH THE ROOFING MANUFACTURER AND ARCHITECT.
R. COORDINATE WITH ARCHITECTURAL FLOOR PLANS, ELEVATIONS AND CASEWORK DETAILS FOR LOCATION OF ADDITIONAL RECEPTACLES, UTILITY OUTLETS, ELECTRICAL DEVICES, ETC.
S. CEILING-MOUNTED ELECTRICAL DEVICES SHALL BE CENTERED IN 2'X2' CEILING TILE AND INSTALLED CENTERED ON 2' DIMENSION OF 2'X4' TILE AND ON CENTERLINE OR A QUARTER POINT ON 4' DIMENSION.
T. ANY VIBRATING, OSCILLATING OR OTHER NOISE OR MOTION PRODUCING EQUIPMENT SHALL BE ISOLATED FROM SURROUNDING SYSTEMS IN AN APPROVED MANNER. NOISY OR STRUCTURALLY DAMAGING INSTALLATIONS SHALL BE SATISFACTORILY REPLACED OR REPAIRED AT THE INSTALLING CONTRACTORS' EXPENSE. THE FINAL DECISION ON THE SUITABILITY OF A PARTICULAR INSTALLATION'S ACCEPTABILITY SHALL BE THAT OF THE ENGINEER.
U. CHECK ALL THREE PHASE MOTORS WITH A PHASE ROTATION METER, PRIOR TO PLACING IN SERVICE.
V. PROVIDE DETAILED SHOP DRAWINGS TO ENGINEER PRIOR TO PURCHASING OR INSTALLING ANY EQUIPMENT
W. DEVIATIONS IN SIZES, CAPACITIES, FIT, FINISH, ETC. FOR EQUIPMENT FROM THAT PRIME SPECIFIED SHALL BE THE RESPONSIBILITY OF THE PURCHASER OF THAT EQUIPMENT. ANY PROVISIONS REQUIRED TO ACCOMMODATE A DEVIATION, WHETHER APPROVED BY THE ENGINEER OR NOT, SHALL BE THE RESPONSIBILITY OF THE PURCHASER.
X. THE CONSTRUCTION MANAGER, GENERAL CONTRACTOR, OR WHOMEVER HOLDS THE PRIME CONTRACT(S) FOR THIS CONSTRUCTION IS RESPONSIBLE FOR THE COORDINATION, APPEARANCE, SCHEDULING AND TIMELINESS OF THE WORK OF ALL TRADES, CONTRACTORS, SUPPLIERS, INSTALLERS, ETC. POOR OR UNTIMELY WORK ON THE PART OF ANY SUBCONTRACTOR SHALL BE RESOLVED BY THE PARTY WHO ENGAGED THEM ON THIS PROJECT.
Y. WHERE MOUNTING HEIGHTS ARE NOT INDICATED OR ARE IN CONFLICT WITH ANY OTHER BUILDING SYSTEM, CONTACT THE ENGINEER BEFORE AFFECTING INSTALLATION. REFER ALSO TO ARCHITECTURAL INTERIOR AND EXTERIOR ELEVATIONS, CEILING HEIGHTS AND OTHER DETAILS OF THESE DOCUMENTS, AS APPLICABLE.
Z. WHERE FIRE-RATED CEILING ASSEMBLIES ARE NOTED, PROVIDE UL-LISTED FIRE-RATED GYPSUM BOARD OR PRE-MANUFACTURED ENCLOSURES ABOVE LUMINAIRES, CEILING DEVICES, ETC. IN OR ON CEILING, AS REQUIRED TO MAINTAIN CEILING RATINGS.
AA. COORDINATE THE LOCATION OF DRAINS, ELECTRICAL OUTLETS, GAS OUTLETS, ETC. WITH ALL CASEWORK, KITCHEN EQUIPMENT, MECHANICAL ROOM EQUIPMENT, ETC. PRIOR TO COMMENCING INSTALLATION. WORK NOT SO COORDINATED SHALL BE REMOVED AND PROPERLY INSTALLED AT THE EXPENSE OF THE RESPONSIBLE CONTRACTOR(S).
BB. ALL ELECTRICAL COMPONENTS OR EQUIPMENT SHALL BE LISTED AND LABELED BY UNDERWRITER'S LABORATORIES OR OTHER APPROVED LISTING AGENCY. APPROVAL AND LABELING OF INDIVIDUAL COMPONENTS ON AN ASSEMBLY IS NOT ACCEPTABLE AS MEETING THIS REQUIREMENT, UNLESS WAIVED BY THE ENGINEER IN WRITING.
CC. ALL WIRING SYSTEMS SHALL BE INSTALLED WITH A MINIMUM OF SPLICES. CONDUCTORS, WHETHER SINGLE OR MULTI-PAIR, SHALL BE INSTALLED CONTINUOUS INSOFAR AS POSSIBLE FROM TERMINAL POINT TO TERMINAL POINT.
DD. NO CONDUIT, SUPPORTS, ETC. SHALL BE RUN THROUGH ACCESS CLEARANCES OF EQUIPMENT BY OTHER TRADES (I.E. VAV BOXES). COORDINATE WITH ALL TRADES PRIOR TO CONSTRUCTION.
EE. ALL CONTRACTORS SHALL EXERCISE EXTREME CARE IN THE COURSE OF THEIR WORK SO AS TO ENSURE THAT THEY DO NOT INTERRUPT ANY EXISTING SERVICE OR SUB-SERVICE FOR SAFETY PURPOSES. PAY PARTICULAR ATTENTION TO THIS PRECAUTION RELATIVE TO NATURAL GAS AND ELECTRICAL LINES. VERIFY THE LOCATION, SIZE, TYPE, ETC. OF EACH UNDERGROUND OR OVERHEAD UTILITY. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL FEDERAL, STATE AND/OR LOCAL RULES, REGULATIONS, STANDARD AND SAFETY REQUIREMENTS. UTILITIES SHALL BE INSTALLED IN ACCORDANCE WITH THE APPLICABLE MUNICIPALITY OR UTILITY COMPANY STANDARDS. IN ALL CASES, THE MOST STRINGENT REQUIREMENT SHALL APPLY.
FF. ALL SUPPORTS FOR EQUIPMENT, DEVICES OR FIXTURES SHALL BE UNIQUE, DIRECTLY FROM THE BUILDING STRUCTURE. DO NOT SUPPORT WORK FROM OTHER TRADES EQUIPMENT OR SUPPORTS WITHOUT WRITTEN PERMISSION FROM THE ENGINEER AND CONSENT OF THE OTHER TRADE, IN WRITING.
GG. WHERE INTERRUPTING AN EXISTING UTILITY OR SERVICE DELIBERATELY OR ACCIDENTALLY, THE RESPONSIBLE CONTRACTOR SHALL WORK CONTINUOUSLY AS NEEDED TO RESTORE SAME, PROVIDING PREMIUM TIME AS NEEDED.
HH. REFER TO ARCHITECTURAL WALL ELEVATIONS (WHERE GIVEN) FOR HEIGHTS AND MOUNTING RELATIONSHIP OF OUTLETS AND EQUIPMENT. IF IN DOUBT, CONTACT ENGINEER FOR DIRECTION PRIOR TO ROUGH IN.
II. FLUSH OR PEDESTAL TYPE FLOOR OUTLETS/BOXES, AS INDICATED ON PLAN, SHALL BE LOCATED BY DIMENSIONS PROVIDED BY THE ARCHITECT, UNLESS OTHERWISE SHOWN ON PLANS. IF IN DOUBT, CONTACT THE ENGINEER PRIOR TO ROUGHING-IN ANY WORK.
JJ. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING AND PATCHING REQUIRED FOR HIS WORK. ALL CUTTING AND PATCHING SHALL BE IN ACCORDANCE WITH THE ARCHITECT'S STANDARDS FOR SUCH WORK.
KK. ALL WORK SHALL BE CONCEALED UNLESS SPECIFICALLY INDICATED TO BE EXPOSED, OR REQUIRED TO BE EXPOSED. IF IN DOUBT, CONTACT THE ENGINEER FOR CLARIFICATIONS PRIOR TO INSTALLING ANY SUCH WORK.
LL. WHERE BACKBOXES ARE LOCATED IN THE SAME VERTICAL CHANNEL/STUD SPACE ON OPPOSITE SIDES OF THE SAME WALL, PROVIDE SOUND-INSULATING PUTTY AROUND BOXES AS REQUIRED TO ELIMINATE SOUND TRANSMISSION FROM ROOM TO ROOM.
MM. JUNCTION BOXES LOCATED ABOVE ACCESSIBLE CEILINGS SHALL BE LOCATED NO MORE THAN 36" ABOVE CEILING LEVEL. LABEL EACH BOX IN AREA OF WORK WITH A PERMANENT MARKER OR IN ACCORDANCE WITH SPECIFICATIONS, WHICHEVER IS MORE STRINGENT.
NN. ALL MATERIALS FURNISHED AND ALL WORK INSTALLED SHALL COMPLY WITH THE CURRENT EDITION OF THE NATIONAL ELECTRICAL CODES, NATIONAL FIRE CODES OF THE NATIONAL FIRE PROTECTION ASSOCIATION, THE REQUIREMENTS OF LOCAL UTILITY COMPANIES, AND WITH THE REQUIREMENTS OF ALL GOVERNMENTAL AGENCIES OR DEPARTMENTS HAVING JURISDICTION. IF ANY CONFLICTS OR DISCREPANCIES OCCUR THE MOST STRINGENT SHALL APPLY.
OO. DO NOT SCALE FROM DRAWINGS, AS PRINTING DISTORTS SCALE. WORK SHALL BE LAID OUT FROM DIMENSIONED DRAWINGS, OR DIMENSIONS SUPPLIED TO THE CONTRACTOR.
PP. NOISY WORK, WORK OUTSIDE CONSTRUCTION BARRIERS, WORK IN OCCUPIED AREAS, ETC. SHALL BE PERFORMED AFTER HOURS OR ON WEEKENDS. COORDINATE EXACT SCHEDULING WITH FACILITY PRIOR TO CONSTRUCTION.
QQ. ALL ITEMS HAVING KEYED LOCKS/OPERATORS SHALL HAVE CORED LOCKS/OPERATORS. ALL KEYING SHALL MATCH THE OWNER'S EXISTING KEY-WAYS. COORDINATE EXACT REQUIREMENTS WITH OWNER PRIOR TO CONSTRUCTION.
RR. REFER TO ARCHITECTURAL PLANS FOR PHASING REQUIREMENTS. WORK SHALL BE COMPLETED IN PHASES PER THE PHASING PLAN AND AS COORDINATED WITH OWNER AND GENERAL CONTRACTOR. PROVIDE ALL REQUIRED INCREMENTAL INSPECTIONS, CERTIFICATIONS, ETC. AND ALL TEMPORARY SERVICES AS REQUIRED BY OWNER TO ACCOMPLISH THE PHASING PLAN.
SS. UNLESS OTHERWISE SPECIFIED OR INDICATED, INSTALL LIGHT FIXTURES, SMOKE DETECTORS, SPEAKERS AND OTHER CEILING MOUNTED APPURTENANCES IN THE CEILING IN A SYMMETRICAL PATTERN, UNLESS SPECIFICALLY INDICATED OTHERWISE.
TT. WHERE EXIT LIGHTS ARE CONNECTED TO EMERGENCY CIRCUITS WITH KEYSWITCH OR CONTACTOR CONTROL, AN UNSWITCHED LINE SHALL BE PULLED IN TO MAINTAIN THEIR OPERATION REGARDLESS OF SWITCH POSITION.
UU. LOCATE CABLE- AND CHAIN-HUNG INDUSTRIAL FIXTURES IN MECHANICAL ROOMS TO AVOID DUCTWORK AND PIPING, TO MAXIMIZE AVAILABLE LIGHT AND SPACE AROUND EQUIPMENT, AIR HANDLERS, ETC., TO PROVIDE ADEQUATE LIGHTING TO ALL AREAS OF ROOM. PROVIDE ADDITIONAL FIXTURES OF SAME TYPE AS NEEDED TO FULFILL THIS REQUIREMENT. LIGHT FIXTURES SHALL NOT BE MOUNTED BELOW 7'-6" A.F.F.
VV. ALL LIGHTING FIXTURE LENSES, DOWNLIGHTING ALZAK CONES AND LOUVERS SHALL BE HANDLED WITH COTTON GLOVES DURING INSTALLATION AND LAMPING TO AVOID FINGERPRINTS OR DIRT DEPOSITS. IT IS PREFERRED THAT FIXTURES BE SHIPPED AND INSTALLED WITH CLEAR PLASTIC BAGS TO PROTECT LOUVERS. AT CLOSE OF PROJECT AND AFTER CONSTRUCTION AIR FILTERS ARE CHANGED, REMOVE BAGS. ANY LOUVER OR CONE SHOWING DIRT OR FINGER PRINTS SHALL BE CLEANED WITH SOLVENT RECOMMENDED BY THE MANUFACTURER, OR REPLACED AS NECESSARY IN ORDER TO TURN OVER TO THE OWNER NEW FIXTURES AT OCCUPANCY.
WW. REFER TO ARCHITECTURAL DETAILS AS APPLICABLE FOR RECESSED SOFFIT LED FIXTURES. ADJUST FIXTURE LENGTHS BY FIELD MEASUREMENT OF SOFFIT, AS NECESSARY.
XX. CONTRACTOR SHALL INSTALL INTERIOR DISCONNECT SWITCHES, MOTOR RATED SWITCHES, STARTERS, ETC. IN A NEMA 1 ENCLOSURE AND IN A NEMA 3R ENCLOSURE FOR EXTERIOR UNITS, UON. DEVICES ARE TO BE WITHIN SIGHT OF THE UNIT SERVING, IN A MAINTENANCE ACCESSIBLE LOCATION. COORDINATE ALL SIZES WITH FINAL EQUIPMENT SHOP DRAWING DATA PRIOR TO ROUGH-IN AND/OR START OF WORK.
YY. ALL FLOOR SLEEVES SHALL BE SEALED WATER TIGHT.
ZZ. THE CONTRACTOR SHALL PROVIDE AND LOCATE ALL SLEEVES AND INSERTS REQUIRED FOR HIS WORK BEFORE THE FLOORS AND SURFACE BEING PENETRATED ARE BUILT. CORING OF ANY ELEVATED DECK SHALL NOT BE ACCEPTED. ALL METAL DECK PENETRATIONS SHALL BE COORDINATED AND SLEEVED. ANY COSTS INCURRED DUE TO LACK OF COORDINATION SHALL BE BORNE BY THIS CONTRACTOR. WHERE SLEEVES ARE PLACED IN EXTERIOR WALLS OR IN SLABS ON GRADES, THE SPACE BETWEEN THE PIPE OR CONDUIT AND THE SLEEVES SHALL BE MADE COMPLETELY AND PERMANENTLY WATER TIGHT.
AAA. REFER TO SMI AND SMO DESCRIPTIONS. REFER TO DETAILS FOR # OF DATA OUTLETS REQUIRED.
BBB. ALL HVAC LOW VOLTAGE CABLE TO BE YELLOW PLENUM RATED. THIS INCLUDES COMM CABLE AND THERMOSTAT WIRING. ALL ELECTRICAL LOW VOLTAGE (LIGHTING CONTROLS, RELAY CONTROLS) TO BE PLENUM RATED YELLOW CABLE. THIS INCLUDES COMMUNICATION CABLING FOR ELECTRICAL.

GENERAL RECEPTACLE NOTE:

ALL RECEPTACLES IN AND OPEN TO CLASSROOMS, CORRIDORS, GYM, CAFETERIA, AND COMMON SPACES ACCESSIBLE TO STUDENTS SHALL BE SAFETY TYPE, TAMPER-RESISTANT RECEPTACLES.

BACKBOX SCHEDULE :

INDICATING NO.	SIZE REQUIRED
1G	4-11/16" SQUARE x 2-1/8"D TWO-GANG BACKBOX (STEEL CITY #72171) WITH SINGLE-GANG 3/4" RAISED EXTENSION RING. (STEEL CITY #72-C-14)
1GD	5" SQUARE x 2-7/8"D TWO-GANG BACKBOX WITH SINGLE OR DOUBLE-GANG 3/4" RAISED EXTENSION RING, AS REQUIRED.
2G	4-11/16" SQUARE x 2-1/8"D TWO-GANG BACKBOX (STEEL CITY #72171) WITH TWO-GANG 3/4" RAISED EXTENSION RING. (STEEL CITY #72-C-18)
2G-A	6-13/16" x 4-1/2"H x 2-1/2"D TWO-GANG BACKBOX (STEEL CITY #H2BD) WITH TWO-GANG 3/4" RAISED EXTENSION RING AS REQUIRED.
3G	8-5/8" x 4-1/2" x 2-1/2"D THREE-GANG BOX (STEEL CITY #H3BD) WITH THREE-GANG 3/4" RAISED EXTENSION RING AS REQUIRED.
4G	10-17/16" x 4-1/2" x 2-1/2"D FOUR-GANG BACKBOX (STEEL CITY #H4BD) WITH FOUR-GANG 3/4" RAISED EXTENSION RING AS REQUIRED.
V	BACKBOX EXTENSION RING AND COVERPLATE PROVIDED BY VENDOR AND INSTALLED BY CONTRACTOR.

GENERAL NOTES (POKE-THRU/FLOOR BOXES):

A. ALL ABOVE SLAB DEVICES SHALL BE SCRUB WATER RATED.
B. ALL ON GRADE DEVICES SHALL BE CAST IRON OR RATED FOR ONGRADE USE.
C. FLOOR BOX FLANGE/FLOOR TYPE REQUIREMENTS SHALL BE COORDINATED WITH ARCHITECTURAL FLOOR FINISH PRIOR TO SUBMISSION. PROVIDE FLANGE SETTINGS, TILE/CARPET OR BARE CONCRETE COORDINATED FLOOR BOXES AS REQUIRED FOR FLOOR.
D. CONTRACTOR SHALL PROVIDE ALL SYSTEMS AND POWER CONDUITS (REFER TO STUB-OUT DETAIL FOR DEVICE TYPE AND NUMBER OF CONDUITS U.O.N.) AT CEILING SPACE BELOW UP IN NEAREST WALL TO ABOVE ACCESSIBLE CEILING AS REQUIRED FOR SYSTEMS STUB OUTS, POWER CIRCUITING, ETC. REFER TO FLOOR PLANS AND DEVICES AND PROVIDE AS REQUIRED.
E. WHERE SYSTEMS FURNITURE CONNECTIONS ARE REQUIRED, CONTRACTOR SHALL PROVIDE FLEXIBLE CONDUIT WHIPS WITH APPROPRIATE CONNECTION AT EACH END FOR FLOOR BOX AND SYSTEMS FIRNITURE CONNECTIONS. APPLIES FOR POWER AND SYSTEMS CONNECTIONS.
F. PROVIDE SEPERATE COMPARTMENTS FOR POWER AND SYSTEMS CONNECTIONS OR DIVIDERS LISTED FOR THAT USE BY THE MANUFACTURER.
G. COORDINATE EXACT FLOOR BOX LOCATIONS WITH ARCHITECT PRIOR TO ROUGH-IN.

DESCRIPTION	MOUNTING HEIGHT	DRAWING SYMBOL
SWITCHES		
LIGHT SWITCH:GENERAL PURPOSE	48" TO TOP OF BOX	$
NIGHT LIGHT SWITCH WITH CONSTANTLY ILLUMINATED HANDLE		$N
DIMMER SWITCH		$D
THREE-WAY SWITCH		$3
FOUR-WAY SWITCH		$4
KEYED SWITCH		$K
OCCUPANCY OR VACANCY SENSOR SWITCH		$OS, $VS
LIGHT SWITCH FOR UNDER-CABINET LIGHTS		$U
ILLUMINATED HANDLE LIGHT SWITCH (ILLUMINATED WHEN LOAD IS OFF)		$IL
LOW VOLTAGE MOMENTARY SWITCH		$LV
PILOT LIGHT SWITCH (ILLUMINATED WHEN LOAD IS ON)		$PL
NON-REVERSING MOTOR STARTER SNAP SWITCH	AS NOTED	$M
2-POLE NON-REVERSING MOTOR STARTER SNAP SWITCH	AS NOTED	$2M
MOMENTARY CONTACT SWITCH	48" TO TOP OF BOX	$MC
HAND-OFF-AUTO 3-POSTION SWITCH		$HOA
REMOTE INVERTER REFER TO LIGHT FIXTURE SCHEDULE FOR DETAILS.	CLG	E
OCCUPANCY OR VACANCY SENSOR, CEILING MOUNT	CLG	OS, VS
PHOTO-CELL AS NOTED	AS NOTED	PC
DAYLIGHT SENSOR, CEILING MOUNTED	CLG	DS
POWER OUTLETS		
SIMPLEX RECEPTACLE	1'-6"	
DUPLEX RECEPTACLE-SAFETY TYPE, TAMPER-RESISTANT	1'-6"	
SLASH THROUGH ANY DEVICE INDICATES MOUNTING ABOVE COUNTERTOP 2" ABOVE BACKSPLASH, OR AT 48" WHERE NO COUNTER IS PRESENT, TAMPER-RESISTANT	4'-0"	
FILLED CENTER BAR INDICATES INTEGRAL GROUND FAULT PROTECTION (GFCI), SAFETY TYPE, TAMPER-RESISTANT	1'-6"	
DEAD FRONT GFCI DEVICE, LABEL AND INSTALL IN READILY ACCESSIBLE LOCATION		
FILLED OUTER BARS INDICATES INTEGRAL INTEGRAL USB OUTLETS IN ADDITION TO POWER RECEPTACLES, SAFETY TYPE, TAMPER-RESISTANT	1'-6"	
GANG RECEPTACLE IN COMBINATION WITH SWITCH (PROVIDE DIVIDER IF LIGHTING CIRCUIT IS 277V)	4'-0"	C/S
DUPLEX RECEPTACLE, CEILING MOUNTED	CLG	
QUADRUPLEX RECEPTACLE, SAFETY TYPE, TAMPER-RESISTANT	1'-6"	
JUNCTION BOX, CEILING OR WALL		J, J
VOLTAGE/1PH RECEPTACLE, AS NOTED	AS NOTED	
VOLTAGE/3PH RECEPTACLE, AS NOTED	1'-6"	
"DOG-HOUSE" TYPE TWIN DUPLEX RECEPTACLE WITH ONE DUPLEX RECEPTACLE ON BOTH SIDES	ON CNTR.	DP
SS INDICATES SURGE SUPPRESION TYPE OUTLET(S)		SS
GROUND FAULT PROTECTED DUPLEX WITH WEATHER-PROOF "WHILE IN USE" TYPE DIE-CAST METAL COVERPLATE WITH LOCKABLE ENCLOSURE AT OUTLET - SEE SPECIFICATIONS	2'-2"	WP
DUPLEX FOR ELECTRIC WATER COOLER: PROVIDE REMOTE, READILY ACCESSIBLE GFI DEVICE AT 48" ADJACENT TO WATER COOLER, COORDINATE EXACT LOCATION WITH PLUMBING CONTRACTOR TO CONCEAL OUTLET BEHIND COOLER		EWC
FIRE ALARM		
MAIN CONTROL PANEL CENTRAL PROCESSING UNIT (CPU) (VOICE ANNUNCIATION)	6'-6" TO TOP	FACP
PULL STATION : DUAL ACTION, PUSH/PULL WITH STI STOPPER II COVER	48" TO LEVER	F
AUDIO/VISUAL NOTIFICATION APPLIANCE, 110 CANDELA STROBE	WALL, CLG	F, F
AUDIO-ONLY NOTIFICATION APPLIANCE	WALL, CLG	A, A
VISUAL-ONLY NOTIFICATION APPLIANCE, 110 CANDELL STROBE	WALL, CLG	V, V
EXTERIOR ELECTRIC BELL	80"	B
PHOTO-ELECTRIC SMOKE DETECTOR	CLG	SD
HEAT DETECTOR	CLG	HD
CARBON MONOXIDE DETECTOR WITH SOUND BASE	CLG	CD SB
DOOR HOLDER : WALL TYPE	WALL	DH
DOOR HOLDER : CLOSURE TYPE	ABV DOOR	DH C
DUCT SMOKE DETECTOR	ABV CLG	DD
CONNECTION TO SPRINKLER FLOW SWITCH WITH ADDRESSABLE MODULE		FS
CONNECTION TO SPRINKLER TAMPER SWITCH WITH ADDRESSABLE MODULE		TS
PRESSURE SWITCH		PS
REMOTE L.C.D. FIRE ALARM ANNUNCIATOR	54"	FAA
POST INDICATOR VALVE		PIV
POWER SUPPLY/CONTROL FOR AUDIO/VISUAL DEVICES	4'-0"	NAC
FIRE ALARM CONTROL EXTENDER		EXT
ISOLATION MODULE	WALL	I
ZONE ADDRESSABLE MODULE		Z
H.V.A.C. SMOKE DAMPER CONNECTION		SM
FLUSH MOUNTED REMOTE ALARM INDICATING STATION/TEST SWITCH	7'-6"	RI
FIREMAN'S KNOX BOX CONNECTION		KB
ADDRESSABLE RELAY MODULE		R
INDICATES VANDAL-PROOF POLYCARBONATE COVER, VANDAL PROOF COVERS SHALL BE UL LISTED FOR USE WITH THE SPECIFIC DEVICE THEY ARE PROTECTING		PC
DEVICE USED FOR ELEVATOR CONTROL		EL

DESCRIPTION	MOUNTING HEIGHT	DRAWING SYMBOL
LIGHTING		
REFER TO LUMINAIRE SCHEDULE FOR EXACT FIXTURE SPECIFICATIONS, MOUNTING HEIGHTS, ETC.		
SURFACE OR SUSPENDED CEILING FIXTURE (SLASH INDICATES RECESSED)		
POLE MOUNTED AREA LIGHT		
EMERGENCY BATTERY WALL-PACK		
WALL MOUNT FIXTURE		
FLOODLIGHT		
EXIT LIGHT (CEILING, END, WALL MOUNT)		
STRIP FIXTURE		
MISCELLANEOUS		
CONDUIT CONCEALED IN WALLS OR IN CEILING SPACE: ARROW(S) INDICATE(S) HOME RUN & # OF CIRCUITS: HASHMARKS INDICATE # OF CONDUCTORS. DASHED LINE INDICATES CONDUIT BELOW FLOOR.		GROUND, NEUTRAL, PHASE
DISCONNECT SWITCH	5'-0"	
MAGNETIC STARTER	5'-0"	
MAGNETIC COMBINATION STARTER	5'-0"	
VARIABLE FREQUENCY DRIVE	5'-0"	
ENCLOSED FLUSH MTD. CIRCUIT BREAKER	5'-0"	
CIRCLE ON ANY DEVICE INDICATES DEVICE FED FROM STUB UP CONDUIT		
FLEXIBLE CONDUIT		
PANELBOARD, SURFACE OR FLUSH MOUNTED, HATCHING INDICATES EMERGENCY	6'-6" TO TOP	
TRANSFORMER	AS NOTED	
EQUIPMENT TAG, REFER TO EQUIPMENT SCHEDULE		EQUIP-1
TAGGED NOTE		
REVISION TAG		
CABLE TRAY AS NOTED	AS SHOWN	
LOW VOLTAGE CABLE PATH	AS SHOWN	
DOORBELL PUSHBUTTON STATION, PROVIDE COMPLETE WITH TRANSFORMER (MOUNT ABOVE CEILING IN CORRIDOR NEAR PUSH-BUTTON) AND ALL ACCESSORIES, POWER FROM NEAREST AVAILABLE 120V NORMAL POWER GENERAL RECEPTACLE CIRCUIT, NUTONE OR EQUAL	4'-0"	DB
DOORBELL AUDIO/VISUAL STATION, PROVIDE PROVIDE CONNECTION TO PUSHBUTTON STATION IN AREA. COORDINATE EXACT AUDIO SOUND (CHIME, BUZZER, ETC.) DESIRED WITH OwNER/ARCHITECT, NUTONE OR EQUAL	7'-6"	DB
EQUIPMENT HARDWIRE CONNECTION (SEE DETAIL)		
KITCHEN EQUIPMENT OUTLET COUPLING CONNECTION (SEE DETAIL)		K
MOTOR CONNECTION, REFER TO EQUIPMENT CONNECTION SCHEDULE		
INDICATES MOUNTING ABOVE COUNTER-TOP, 2" ABOVE BACKSPLASH, NO HIGHER THAN 48"		C
WIREGUARD - PROVIDE MANUFACTURER'S SPECIFIC GUARD FOR DEVICE NOTED		WG
WEATHERPROOF - NEMA-3R, WET LOCATION LISTED. PROVIDE COVERS, RATINGS, ETC, AS SUITABLE FOR OUTDOORS.		WP
PLUMBING FIXTURE SOLENOID VALVE/ELECTRIC EYE SENSOR CONNECTION. COORDINATE EXACT CONNECTION REQUIREMENTS WITH MANUFACTURER.		
PLUMBING FIXTURE ELECTRIC EYE TRANSFORMER CONNECTION. TRANSFORMER SHALL BE 120V-24V. MOUNT ABOVE SUPPORTED ACCESSIBLE CEILING IN J-BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED		
PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS). PROVIDE W/PERMANENT LOCKING MEANS AT BREAKER.	VERIFY WITH ARCHITECT	
SURGE PROTECTION DEVICE		SPD
THERMOSTAT PROVIDED BY MECHANICAL CONTRACTOR, ELECTRICAL CONTRACTOR SHALL PROVIDE BACK-BOX CONDUIT STUB-UP, REFER TO MECHANICAL DRAWINGS FOR LOCATIONS		T
CONDUIT UP		
CONDUIT DOWN		
GROUND BUS BAR ON INSULATED STANDOFFS	2'-0"	
DATA / VOICE		
DATA OUTLET : NUMBER BESIDE OUTLET INDICATES NUMBER OF DATA JACKS	1'-6"	#D ▽
"C" INDICATES MOUNTING ABOVE COUNTERTOP. DATA OUTLET : NUMBER BESIDE OUTLET INDICATES NUMBER OF DATA JACKS	4'-0"	#D ▽C
VOICE OUTLET : NUMBER BESIDE OUTLET INDICATES NUMBER OF VOICE JACKS	1'-6"	#V ▼
COMBINATION OUTLET : NUMBER BESIDE OUTLET INDICATES NUMBER OF DATA/VOICE JACKS	1'-6"	#D/#V
MAIN DISTRIBUTION FRAME - REFERENCE DATA SYSTEM SCHEMATICS AND DETAILS FOR ADDITIONAL REQUIREMENTS		MDF
INTERMEDIATE DISTRIBUTION FRAME - REFERENCE DATA SYSTEM SCHEMATICS AND DETAILS FOR ADDITIONAL REQUIREMENTS		IDF
TELECOMMUNICATIONS SYSTEM BACKBOARD. PROVIDE 96"H x 3/4"D FIRE-RETARDENT PLYWOOD BACKBOARD WITH TWO (2) COATS OF NON-C0NDUCTIVE, FIRE-RETARDANT LIGHT GRAY PAINT. INSTALL BOARD AT 2' AFF. (LENGTH OF BOARD AS INDICATED ON FLOOR PLAN)		TEL
WIRELESS ACCESS POINT WITH PROVISIONS FOR TWO (2) CAT6A DATA OUTLET FOR ANTENNA. PROVIDE A COMPLETE DATA OUTLET WITH FACEPLATE ABOVE CEILING, MOUNTED AT AN ACCESSIBLE HEIGHT NO MORE THAN 24" ABOVE CEILING. AT EACH OUTLET, PROVIDE A 10' COIL OF CABLE AHEAD OF THE OUTLET FOR ADJUSTMENT OF FINAL OUTLET LOCATION. THE CONTRACTOR SHALL COORDINATE EXACT LOCATIONS WITH THE OWNER AND ADJUST OUTLET LOCATIONS AT SUBSTANTIAL COMPLETION TO ACCOMMODATE OWNER'S WAP LOCATIONS. WAP'S ARE OWNER-FURNISHED, OWNER-INSTALLED		WAP ▽
WALL MOUNTED VOICE OUTLET	48" TO TOP OF BOX	W ▼

DESCRIPTION	MOUNTING HEIGHT	DRAWING SYMBOL
ABBREVIATIONS		
UNLESS OTHERWISE NOTED		UON
OWNER FURNISHED CONTRACTOR INSTALLED		OFCI
OWNER FURNISHED OWNER INSTALLED		OFOI
CONTRACTOR FURNISHED CONTRACTOR INSTALLED		CFCI
CONTRACTOR FURNISHED OWNER INSTALLED		CFOI
FLOOR BOX AND POKE THROUGH OUTLETS		
FLOORBOX, POWER ONLY, AS SCHEDULED	FLOOR	
FLOOR BOX WITH (4) USB DUPLEX OUTLETS AND (4) DATA OUTLETS. PROVIDE LOW-VOLTAGE BARRIER. BRUSHED ALUMINUM COVER. WIREMOLD #EFB8S SERIES.	FLOOR	FB-A
FLOOR BOX WITH (4) USB DUPLEX OUTLETS, (2) DATA OUTLETS AND (1) VOICE OUTLET. PROVIDE LOW-VOLTAGE BARRIER. BRUSHED ALUMINUM COVER. WIREMOLD #EFB8S SERIES.	FLOOR	FB-B
FLOOR BOX WITH (1) QUADRADUPLEX OUTLET, (1) DATA OUTLET AND (1) POINT OF SALE (POS) OUTLET. PROVIDE LOW-VOLTAGE BARRIER. BRUSHED ALUMINUM COVER. WIREMOLD #EFB8S SERIES.	FLOOR	FB-C
FIRE RATED POKE THOUGH BOX WITH (2) USB DUPLEX OUTLETS, (2) DATA OUTLETS AND (1) VOICE OUTLET. PROVIDE LOW-VOLTAGE BARRIER. BRUSHED ALUMINUM COVER. WIREMOLD #8AT SERIES.	FLOOR	PT-1
TELEVISION		
TELEVISION SPLITTERS/AMPLIFIERS/DISTRIBUTION	4'-0"	TV-HE
TELEVISION SYSTEM OUTLET WITH DUPLEX RECEPTACLE, COORDINATE LOCATION WITH WALL BRACKET WHERE APPLICABLE	7'-0"	T
OVERHEAD PAGING		
PAGING SPEAKER: CEILING. QUAM SYSTEM 12 OR EQUAL	CLG	S
PAGING SPEAKER W/ VOLUME CONTROL. QUAM SYSTEM 12/VC OR EQUAL	CLG	SV
WALL MOUNTED PAGING HORN	9'-0"	H
PAGING SPEAKER: WALL QUAM 1VP OR EQUAL.	8'-0"	S
EXTERIOR VANDAL PROOF / WEATHERPROOF WALL MOUNTED PAGING SPEAKER, SHALL BE PAINTED COLOR SELECTED BY ARCHITECT/OWNER. QUAM 6VP OR EQUAL	COORD. W/ ARCHITECT	S EXT.
PAGING SPEAKER, VANDEL PROOF	44"	S VP
LCD WALL DISPLAY		LD
PAGING MICROPHONE	1'-6"	M
PAGING SYSTEM AMPLIFIER/TUNER CABINET, OFOI	4'-0"	PA
SECURITY INTERCOM		
AUDIO/VIDEO INTERCOM STATION: MASTER WITH SELECTIVE DOOR CONTROLS, POWER SUPPLIES & DOOR RELAY CONTACTS AS REQUIRED FOR OPERATION OF ANY DOOR IN THE SYSTEM AND VIEWING OF ANY AUDIO/VIDEO INTERCOM REMOTE ON THE SYSTEM. AIPHONE#AX-MV W/DESK STAND - COLOR BY ARCHITECT.	18"	IM
AUDIO/VIDEO INTERCOM STATION: REMOTE WITH FLUSH-MTD S.S. ENCLOSURE. AIPHONE #AX-DVF.	4'-0"	IR
SECURITY CCTV VIDEO SURVEILLANCE		
CCTV CAMERA: CEILING MOUNT DOME, OFOI	CLG	CC
CCTV CAMERA: WALL MOUNT DOME, OFOI	WALL	CC
INDICATES EXTERIOR CAMERA RATED FOR CONDITIONS, WET LOCATION LISTED, WITH AUXILLARY HEATER		WP
SECURITY ACCESS CONTROL		
DOOR ALARM CONTACT (POSITION) SWITCH	DOOR FRAME	DA
DOOR RELEASE BUTTON	4'-0"	DR
DOOR POWER SUPPLY	MDF / IDF	DS
ELECTRIC STRIKE	AT LATCH	ES
DOOR RELEASE CARD READER STATION. PROVIDE ANY ADDITIONAL ROUGH-IN FOR "EMERGENCY RELEASE" OPERATOR STATIONS AS REQUIRED.	4'-0"	CR
SAME AS "CR" EXCEPT MULLION MOUNT	4'-0"	CR M
MOTION SENSOR DOOR CONTROL	CEILING	MS
SAME AS "MS" EXCEPT MULLION MOUNT	CEILING	MS M
AI-PHONE IP VIDEO MASTER STATION. PROVIDE 1G WITH DATA AND PATCH CABLE TO PHONE.	DESK	IM
AI-PHONE IP VIDEO DOOR STATION.	4'-0"	AI
ACCESS CONTROL POWER SUPPLIES / CONTROL PANEL	4'-0"	SEC-A
CLASSROOM A/V EQUIPMENT		
CEILING MOUNTED PROJECTOR		
A/V SYSTEM CABLING TERMINATIONS / WALLPLATE		AV
TEACHER STATION (INPUT) MOUNT 2" ABOVE TEACHERS DESK BACKSPLASH. REFER TO DETAIL FOR REQUIREMENTS. PROVIDE RACEWAYS, CABLING AND ONE (1) DATA PER DETAIL.		SMI
MONITOR (OUTPUT) MOUNTED BEHIND MONITOR. REFER TO DETAIL FOR REQUIREMENTS. PROVIDE RACEWAYS, CABLING, OUTLET AND ONE (1) DATA PER DETAIL.	5'-0"	SMO
MEDIA WALL (INPUT). REFER TO DETAIL FOR REQUIREMENTS. PROVIDE RACEWAYS, CABLING AND ONE (1) DATA PER DETAIL.	AS NOTED	MWI
MEDIA WALL (OUTPUT) MOUNTED BEHIND MONITOR. REFER TO DETAIL FOR REQUIREMENTS. PROVIDE RACEWAYS, CABLING, OUTLET AND ONE (1) DATA PER DETAIL.	AS NOTED	MWO
EMERGENCY COMMUNICATION		
AREA OF RESCUE ASSISTANCE COMMAND UNIT	DOOR FRAME	AC
AREA OF RESCUE ASSISTANCE REMOTE STATION	ABV DOOR	AR

DESCRIPTION	MOUNTING HEIGHT	DRAWING SYMBOL
LOCAL SOUND		
WALL MICRO-PHONE OUTLET : SINGLE	1'-4"	M
WALL MICRO-PHONE OUTLETS (# AS NOTED)	1'-4"	M 2, 3 4,
FLOOR MICRO-PHONE OUTLET : SINGLE	FLOOR	M
FLOOR MICRO-PHONE OUTLETS(# AS NOTED)	FLOOR	M2, M3 M4
GYMNASIUM SOUND SYSTEM SPEAKER. PROVIDE OUTLET BOX AT CEILING AND 1" CONDUIT HOMERUN TO GYMNASIUM SOUND SYSTEM AMPLIFIER.	SEE SPECS	GS
CAFETERIA SOUND SYSTEM SPEAKER. PROVIDE OUTLET BOX AT CEILING AND 1" CONDUIT HOMERUN TO CAFETERIA SOUND SYSTEM AMPLIFIER.	SEE SPECS	CS
GYMNASIUM SOUND SYSTEM AMPLIFIER	5'-0" TO CENTER	SS-G
CAFETERIA SOUND SYSTEM AMPLIFIER	5'-0" TO CENTER	SS-C

SYSTEM RESPONSIBILITY MATRIX

SYSTEM	ITEM USED ON PROJECT	DEVICES - O F O I	DEVICES - O F C I	DEVICES - C F C I	PATHWAYS - O F O I	PATHWAYS - O F C I	PATHWAYS - C F C I	CABLING/CONDUCTORS - O F O I	CABLING/CONDUCTORS - O F C I	CABLING/CONDUCTORS - C F C I	TERMINATIONS - O F O I	TERMINATIONS - O F C I	TERMINATIONS - C F C I	SYSTEM SYMBOL
FIRE ALARM	●	⊗		●			●			●			⊗	□
OVERHEAD PAGING / INTERCOM	●	⊠		●			●			●	⊠			◇
SECURITY: INTERCOM	●			●			●			●			●	⬡
SECURITY: ACCESS CONTROL	●	⊗		●			●			●			⊗	⬡
SECURITY: CCTV	●	⊗					●			●			⊗	⬡
TELEVISION	●			●			●			●			⊗	
DATA /VOICE	●			●			●			●			⊗	▽
TELEPHONE	●			●			●			●			⊗	▼

SYSTEM RESPONSIBILITY GENERAL NOTES:

A. REFER TO VENDOR DRAWINGS FOR COMPLETE SCOPE OF WORK RELATING TO VENDOR-FURNISHED EQUIPMENT. ALL WORK INDICATED ON VENDOR DRAWINGS SHALL BE INCLUDED BY THE CONTRACTOR.
B. REFER TO ARCHITECTURAL DOOR HARDWARE SPECIFICATIONS FOR ACCESS CONTROL DEVICE SPECIFICATIONS AND FURTHER REQUIREMENTS.
C. PROVIDE BACKBOXES AND CONDUIT WITH PULL-STRINGS FOR ALL SYSTEMS. CONTRACTOR SHALL VERIFY BACKBOX SIZES, CONDUIT, ETC. AND EXACT INSTALLATION LOCATIONS/REQUIREMENTS WITH SUCCESSFUL VENDORS OF ALL SYSTEMS PRIOR TO CONSTRUCTION.
D. AT ALL SYSTEMS EQUIPMENT CABINET/TERMINAL BOARD LOCATIONS, CONTRACTOR SHALL PROVIDE SIZE AND NUMBER OF CONDUIT STUB-OUTS TO CABLE PATHS AS REQUIRED BY SYSTEM VENDORS, TERMINATE CONDUITS AT CABINETS/ON BACKBOARDS AS REQUIRED. COORDINATE EXACT REQUIREMENTS WITH APPROPRIATE VENDORS PRIOR TO CONSTRUCTION.
E. REFER TO SPECIFICATIONS FOR REQUIREMENTS APPLICABLE TO ALL SYSTEMS INCLUDING CABLING, CABLE MANAGEMENT, INSTALLATION, GROUNDING, TESTING, LABELING, ETC.
F. WHERE INDICATED AS CFCI, THE CONTRACTOR SHALL PROVIDE THE SYSTEM COMPLETE, INCLUDING ALL ROUGH-INS, CABLING, DEVICES, POWER, ETC. THE CONTRACTOR SHALL CONTACT THE LISTED VENDOR FOR PRICING PRIOR TO BID. ALL SYSTEMS SHALL MATCH EXISTING FACILITY STANDARDS AND BE FULLY COMPATIBLE WITH ANY EXISTING SYSTEMS. ALL SYSTEM VENDORS SHALL COORDINATE EXACT SYSTEM REQUIREMENTS WITH OWNER PRIOR TO BID. NEW COMPONENTS SHALL BE INTERCONNECTED WITH EXISTING SYSTEMS WHERE POSSIBLE. ALL NEW SYSTEM DESIGNS AND PROGRAMMING SHALL BE COORDINATED WITH THE OWNER PRIOR TO ORDERING. ALL PROGRAMMING SHALL BE INCLUDED AS REQUIRED BY THE OWNER. PROVIDE A MINIMUM OF 4 HOURS OF TRAINING FOR EACH SYSTEM.

⊗ EXISTING HEAD-END EQUIPMENT. CONTRACTOR TO TERMINATE ALL CABLING TO EXISTING HEAD END.

⊠ EXISTING HEAD-END EQUIPMENT. OWNER TO TERMINATE ALL CABLING TO EXISTING HEAD END. CONTRACTOR SHALL PROVIDE CABLE TO EXISTING HEAD END EQUIPMENT AND PROVIDE 25' OF SLACK FOR TERMINATION.

VARIOUS SYSTEMS SCOPE OF WORK AND REQUIREMENTS:

LOW-VOLTAGE CABLING:
IN AREAS WHERE THERE IS EXPOSED CEILING, SUCH AS THE GYMNASIUM AND CAFETERIA, CABLING SHALL BE ROUTED IN CONDUIT. J-HOOKS AND CABLE TRAYS ARE NOT ACCEPTABLE IN AREAS WITH EXPOSED CEILINGS. ALL CABLING SHALL BE PLENUM RATED.

SYSTEMS EQUIPMENT TERMINAL POINT:
AT ALL SYSTEMS EQUIPMENT CABINET / TERMINAL BOARD LOCATIONS (EQUIP) AS INDICATED ON ELECTRICAL DRAWINGS, CONTRACTOR SHALL PROVIDE SIZE AND NUMBER OF CONDUIT STUB-OUTS TO CABLE PATHS AS REQUIRED FOR CABLING TERMINATE CONDUITS AT CABINETS/ON BACKBOARDS AS REQUIRED. COORDINATE EXACT REQUIREMENTS WITH CABLING INSTALLATION PRIOR TO CONSTRUCTION.

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
BRIAN K. BAUMGARTLE
23119
LICENSED PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company
10411 Meeting Street | Louisville, KY 40059 | 502.326.3085 | cmta.com

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ELECTRICAL LEGEND AND GENERAL NOTES

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

REVISIONS

No.	Description	Date

SHEET

E0.1

1506.2
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/2/2023 9:28:03 AM

GENERAL NOTES (SITE):

A. DO NOT SCALE FROM MECHANICAL AND ELECTRICAL DRAWINGS. FIELD VERIFY REQUIRED DIMENSIONS AND COORDINATE WITH CIVIL DRAWINGS AND SURVEYS.

B. REFER ALSO TO ALL OTHER PLANS AND THE SPECIFICATION, BUT ESPECIALLY TO: THE SITE SURVEY, THE ARCHITECTURAL SITE PLAN, THE SITE GRADING PLAN, THE PLANTING PLAN (WHERE AVAILABLE), FOUNDATION PLAN(S), APPROPRIATE MECHANICAL & ELECTRICAL FLOOR PLANS FOR SERVICE CONTINUATIONS, THE SITE UTILITY PLAN - MECHANICAL & ELECTRICAL. WHERE THERE ARE CONFLICTS AMONG THESE PLANS AND/OR RELATED SPECIFICATIONS, ADVISE THESE ENGINEERS AT LEAST TEN DAYS PRIOR TO SUBMISSION OF BIDS.

C. ALL FEES AND ANY OTHER COSTS TO UTILITY COMPANIES, MUNICIPALITIES, INSPECTORS, REVIEWING AGENCIES, ETC. ARE TO BE INCLUDED AS A PART OF THIS CONTRACT.

D. FEDERAL, STATE, LOCAL, MUNICIPALITY AND UTILITY COMPANY CODES, RULES, REGULATIONS AND REQUIREMENTS APPLY UNLESS EXCEEDED BY THIS DESIGN.

E. WHEN INTERRUPTION OF AN EXISTING UTILITY OR SERVICE IS PLANNED OR OCCURS ACCIDENTALLY, THE CONTRACTOR(S) SHALL WORK CONTINUOUSLY AS NEEDED TO RESTORE SAME PROVIDING PREMIUM TIME AS NEEDED AT NO INCREASE IN THE CONTRACT PRICE.

F. LOCATIONS, DEPTHS, MATERIAL TYPES, ELEVATIONS, ETC. OF ALL APPURTENANCES, LINES, BUILDINGS, ETC. INDICATED ON THESE DRAWINGS WERE TAKEN FROM VARIOUS SOURCES, ARE DIAGRAMMATIC ONLY AND ARE SUBJECT TO SUBSTANTIAL VARIATION FROM EXISTING CONDITIONS, EXISTING UTILITIES LOCATIONS MAY VARY. CONSEQUENTLY ALL CONTRACTORS SHALL EXERCISE EXTREME CARE IN THE COURSE OF THEIR WORK SO AS TO ENSURE THAT THEY DO NOT INTERRUPT ANY EXISTING SERVICE. FOR SAFETY PURPOSES, PAY PARTICULAR ATTENTION TO THIS PRECAUTION RELATIVE TO NATURAL GAS AND ELECTRICAL LINES. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL FEDERAL, STATE, AND/OR LOCAL RULES, REGULATIONS, STANDARDS AND SAFETY REQUIREMENTS.

G. PROVIDE LONG RADIUS ELBOWS FOR UNDERGROUND CONDUIT BENDS. WHERE SERVING A UTILITY OWNED TRANSFORMER, THE UTILTY STANDARDS SHALL TAKE PRECEDENCE.

H. UTILITIES SHALL BE INSTALLED IN ACCORDANCE WITH THE APPLICABLE MUNICIPALITY OR UTILITY COMPANY STANDARDS. IN ALL CASES, THE MOST STRINGENT REQUIREMENT SHALL APPLY. IF ANY VARIATION OCCURS, CONSULT THE ENGINEER. CONTRACTOR SHALL VISIT THE SITE AND FIELD VERIFY THE ROUTING OF ALL UTILITIES NEW AND EXISTING PRIOR TO SUBMISSION OF BIDS. SUBMISSION OF A BID PROPOSAL INDICATES THAT THE CONTRACTOR IS FULLY AWARE OF ALL OBSTRUCTIONS AND WILL INSTALL ALL OF THE NEW UTILITIES WITHOUT REQUESTS FOR ANY ADDITIONAL CHANGES.

I. PROVIDE GALVANIZED RIGID CONDUIT FOR EXTERIOR UNDERGROUND TRANSITIONS TO ABOVE GRADE; EXTEND CONDUIT A MINIMUM OF 6" ABOVE GRADE.

J. CONTRACTOR SHALL CONTACT ENGINEER FOR INSPECTION OF TRENCHES PRIOR TO INSTALLATION OF CONDUITS OR RACEWAYS. PROVIDE PHOTOS UPON REQUEST.

K. CONTRACTOR SHALL CUT AND PATCH ALL PAVEMENT, CURBING, ETC. AS REQUIRED FOR WORK. CONTRACTOR SHALL REPAIR ALL LANDSCAPING THAT IS DAMAGED FOR WORK. FINISH GRADE, SEED AND STRAW ALL DISTURBED GREEN SPACES. ALL PATCH AND REPAIR WORK SHALL BE IN ACCORDANCE WITH BOTH CIVIL AND LANDSCAPE DRAWINGS AND SPECIFICATIONS.

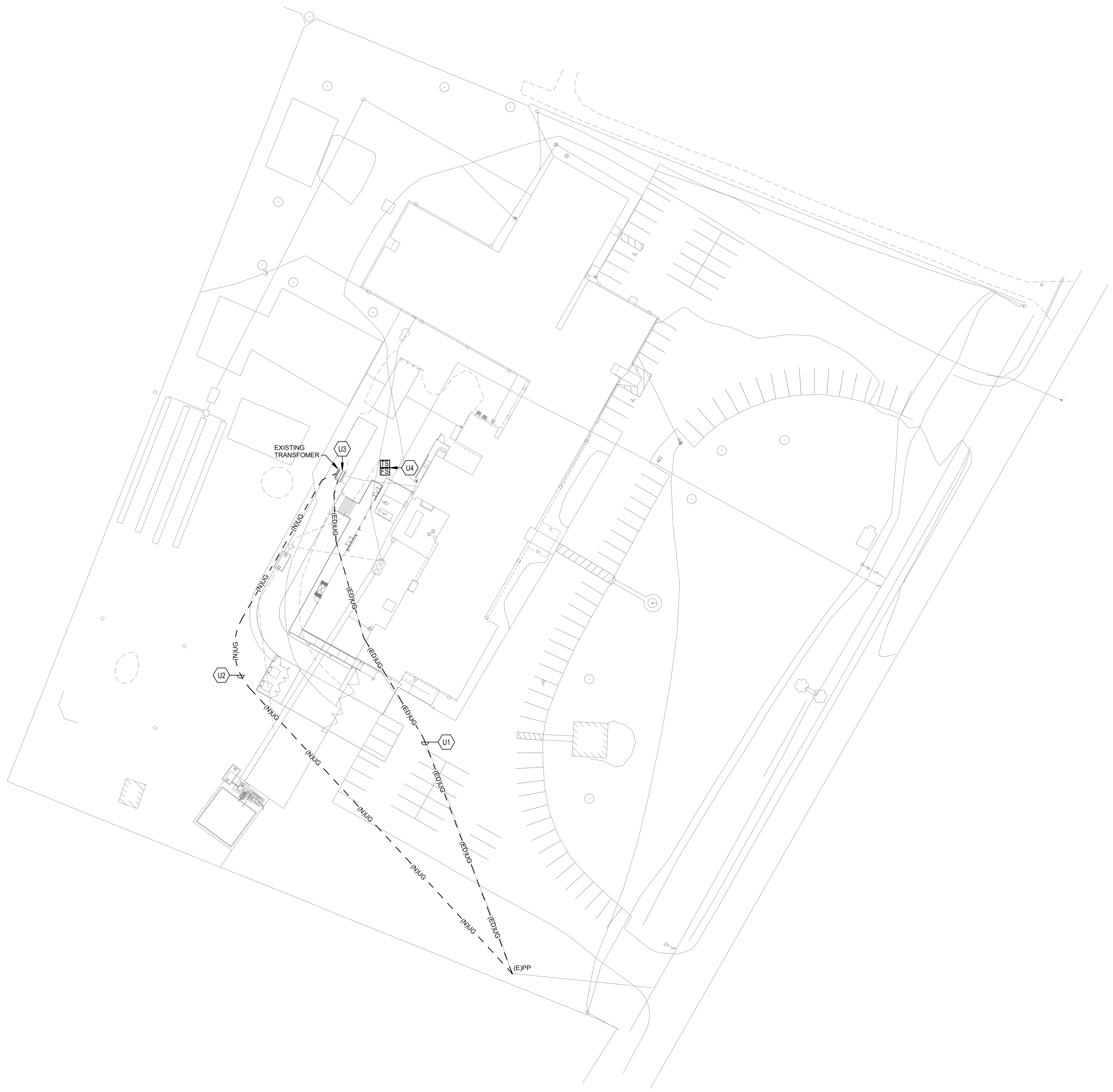
KEYNOTES

U1 COORDINATE AND REMOVE EXISTING PRIMARY CABLING WITH UTILITY COMPANY. REMOVE EXISTING DUCTBANK WHERE NOT UNDER HARDSCAPE OR BUILDING AND CAP ENDS OF ABANDONED CONDUIT(S).

U2 PROVIDE NEW DUCTBANK PRIOR TO REMOVAL OF EXISTING PROMARY (REFER TO U1).

U3 COORDINATE WITH UTILITY COMPANY ANY REWORK OF CONCRETE PAD PRIOR TO INSTALLATION OF NEW PRIMARY DUCTBANK.

U4 TAMPER AND FLOW SWITCH TO BE PROVIDE IN NEW WATER VAULT. REFER TO PLUMBING SITE UTILITY PLAN FOR EXACT LOCATION.



1 SITE PLAN - ELECTRICAL
SCALE: 1" = 40'-0"

ELECTRICAL SITE UTILITIES LINE LEGEND			
	EXISTING	DEMOLITION	NEW
OVERHEAD	(E)OH	(ED)OH	(N)OH
UNDERGROUND	(E)UG	(ED)UG	(N)UG
POWER POLE	(E)PP Ø	(ED)PP Ø	(N)PP Ø
SITE LIGHTS			
ELECTRIC	ELEC		
TELEPHONE	TEL		
CABLE TV	CATV		
FIBER OPTICS	FIBER		
TELECOM	COM		

GENERAL INSTALLATION NOTE:
COORDINATE INSTALLATION AND PIPE CROSSING WITH ALL UTILITIES AND ALL TRADES TO AVOID INTERFERENCE AND TO ENSURE ALL CLEARANCES ARE MET PRIOR TO INSTALLATION.

BEFORE YOU DIG

THE CONTRACTOR AND ALL SUBCONTRACTORS SHALL CONTACT "BUD (BEFORE YOU DIG)" AT 1-800-752-6007 TO OBTAIN UNDERGROUND UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION. ANY CONTRACTOR OR SUBCONTRACTOR PERFORMING ANY TYPE OF EXCAVATION ON THIS PROJECT SHALL CALL "BUD" TO OBTAIN AN AUTHORIZATION NUMBER.

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY BRIAN K. BAUMGARTLE 23119 LICENSED PROFESSIONAL ENGINEER

CMTA A LEGENCE Company
10411 Meeting Street | Louisville, KY 40059 | 502.326.3085 | cmta.com

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

SITE PLAN - ELECTRICAL

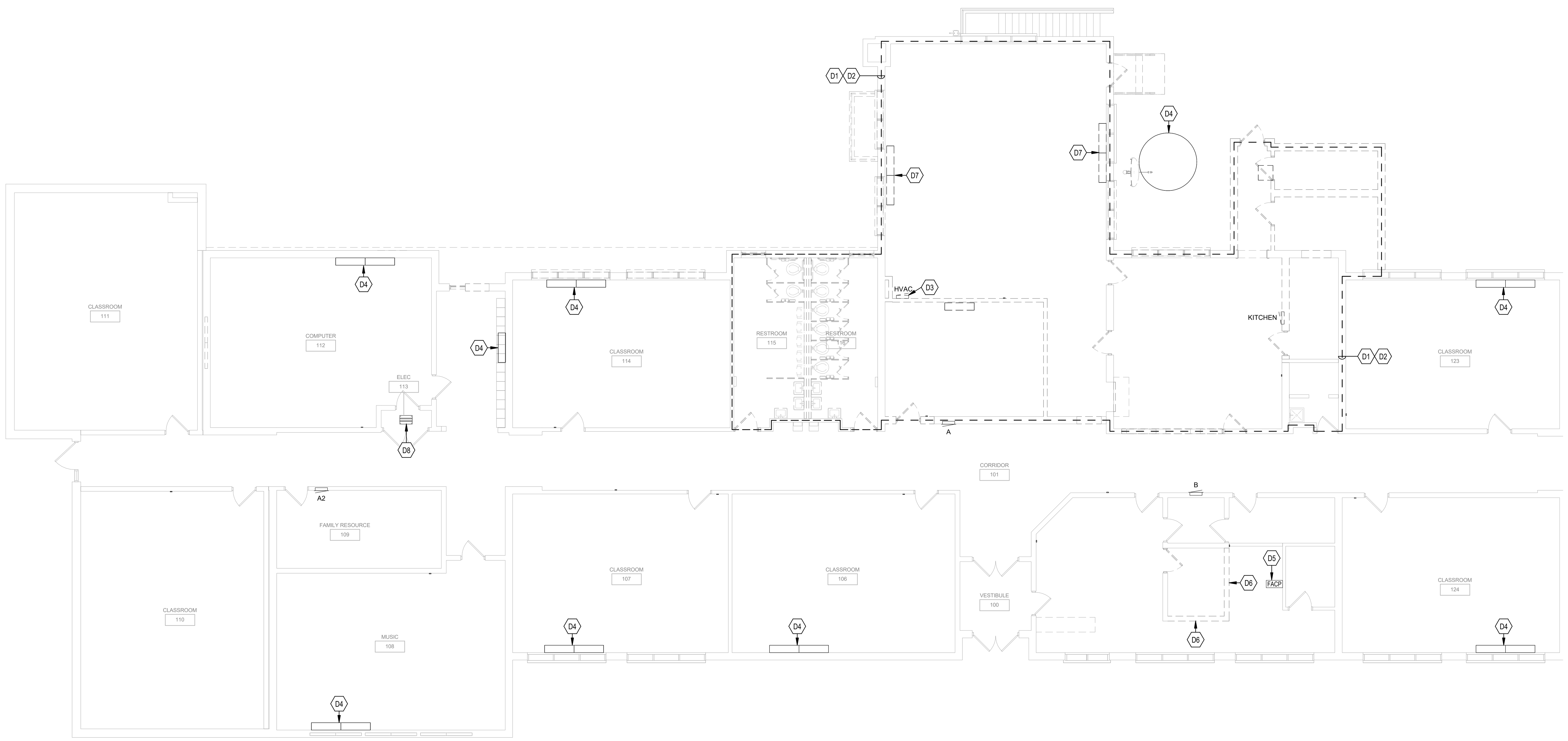
JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

REVISIONS

No.	Description	Date

SHEET
ES.1

1506.2
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/2/2023 9:28:05 AM



1 FIRST FLOOR - DEMOLITION

SCALE: 1/8" = 1'-0"

GENERAL NOTES (DEMOLITION):

A. DOTTED LINES INDICATE ITEMS FOR REMOVAL (UON) AND GRAY SOLID LINES INDICATE EXISTING ITEMS TO REMAIN.

B. DEVICES INDICATED WITH AN "R" SHALL BE RELOCATED. REMOVE, PROTECT, AND REINSTALL IN NEW LOCATION INDICATED ON NEW WORK PLANS. INTERCEPT AND EXTEND ALL EXISTING CABLING TO NEW LOCATION. CLEAN AND RE-LAMP RELOCATED LUMINAIRES.

C. THE CONTRACTOR SHALL MAINTAIN THE CONTINUITY OF EXISTING CIRCUITS THAT CONTAIN DEVICES OR EQUIPMENT THAT ARE TO REMAIN. WHEN DEMOLITION OF AN ELECTRICAL DEVICE (OR CIRCUIT) IS INDICATED ON THE DRAWINGS: THE CONTRACTOR SHALL ENSURE THAT OTHER DEVICES OR EQUIPMENT "UPSTREAM" OR "DOWNSTREAM" ON THE CIRCUITS SHALL REMAIN IN "PRE-DEMOLITION" WORKING ORDER. "LEFT-OVER" CIRCUIT BREAKERS SHALL REMAIN, BE SWITCHED TO OFF POSITION, AND BE LABELED AS SPARES IN THEIR PANELS. PROVIDE NEW TYPEWRITTEN DIRECTORIES FOR ALL PANELS AFFECTED.

D. LOCATIONS OF DEVICES, CONNECTIONS, ETC., INDICATED ON THIS DRAWING WERE TAKEN FROM VARIOUS SOURCES. THEY ARE DIAGRAMMATIC ONLY AND ARE SUBJECT TO VARIATION FROM EXISTING CONDITIONS. CERTAIN EXISTING ELEMENTS MAY NOT BE INDICATED AT ALL. THE CONTRACTOR PROPOSING TO DO ANY PART OF THE WORK INDICATED HEREON SHALL VISIT THIS SITE AND DETERMINE TO HIS SATISFACTION THAT THEY MAY COMPLETE ALL WORK REQUIRED FOR THE BID WHICH HE PROPOSES.

E. REMOVE ALL ASSOCIATED BACKBOXES, CONDUIT AND CONDUCTORS FOR DEVICES / FIXTURES / ETC. BEING REMOVED (BACK TO SOURCE), WHETHER INDICATED OR NOT (UON). CONTRACTOR SHALL PATCH AND REPAIR ANY EXISTING WALLS, FLOORS OR CEILINGS WHERE DEVICES ARE SHOWN TO BE REMOVED (PATCH AND REPAIR TO RECEIVE NEW FINISHES - SEE ARCHITECTURAL PLANS).

F. COORDINATE DISPOSAL OF ALL FIXTURES, DEVICES, ETC. (INDICATED FOR DEMOLITION) WITH OWNER. TURN OVER ITEMS REMOVED TO OWNER AT THEIR OPTION.

G. COORDINATE WITH OTHER TRADES FOR THE REMOVAL AND/OR RELOCATION OF ELECTRICAL DEVICES AND CONNECTIONS ASSOCIATED WITH THEIR EQUIPMENT.

H. PROVIDE TEMPORARY EMERGENCY EXIT LIGHTS AT CONSTRUCTION BARRIERS AS REQUIRED.

I. CONTRACTOR SHALL PATCH AND REPAIR ALL EXISTING WALLS / CEILINGS AS REQUIRED WHERE DEVICES ARE BEING REMOVED OR INSTALLED.

J. UNUSED/ABANDONED CONDUCTORS DISCOVERED ABOVE ACCESSIBLE CEILINGS SHALL BE REMOVED IN ACCORDANCE WITH NEC REQUIREMENTS.

K. EXISTING ELECTRICAL SYSTEMS IN CONFLICT WITH CONSTRUCTION SHALL BE RELOCATED TO PERMIT INSTALLATION OF DEVICES AND EQUIPMENT SHOWN ON PLANS.

L. CONTRACTOR SHALL SEAL ALL EXISTING AND NEW PENETRATIONS OF BUILDING ENVELOPE (EXTERIOR WALLS, ROOF, ETC.) WATER-TIGHT AND AS APPROVED BY ARCHITECT AND ENGINEER. ROOFING SHALL BE RESTORED BY A LICENSED ROOFING CONTRACTOR BASED ON WRITTEN INSTRUCTIONS AND DETAILS FROM ROOFING MANUFACTURER AS REQUIRED TO MAINTAIN ROOF WARRANTY. REFER TO ARCHITECTURAL AND ENGINEERING PLANS AND SPECIFICATIONS FOR FURTHER REQUIREMENTS.

M. ALL EXISTING PANELS AFFECTED BY THIS CONTRACTOR'S WORK SHALL BE PROVIDED WITH NEW TYPE-WRITTEN PANEL DIRECTORIES AND INSERT SLEEVES. PANEL DIRECTORIES SHALL NOT USE ROOM NAMES OR NUMBERS FROM THESE DRAWINGS. DIRECTORIES SHALL BE DETAILED AND COORDINATED WITH OWNER'S SUITE NUMBERS, FINAL ROOM NUMBERS, IT RACK NAMES, WORKSTATION DESIGNATIONS, ETC. UNUSED BREAKERS SHALL BE IN OFF POSITION.

KEYNOTES

D1 ALL MECHANICAL UNIT(S) SHALL BE DEMOLISHED COMPLETE. REMOVE ALL WIRING, CONDUIT, DISCONNECTS, ETC. ASSOCIATED WITH UNIT(S) COMPLETELY BACK TO SOURCE. COORDINATE DEMOLITION OF POWER TO ALL HVAC CONTROL DEVICES BEING REMOVED WITH MECHANICAL CONTRACTOR. UNLESS OTHERWISE NOTED. COORDINATE WITH MECHANICAL DRAWINGS.

D2 ALL EXISTING RECEPTACLES, LIGHTING FIXTURES, DATA DEVICES, FIRE ALARM DEVICES, FIRE ALARM SYSTEMS, ETC. TO BE DEMOLISHED COMPLETE. ALL ASSOCIATED CONDUIT AND WIRING TO BE COMPLETELY REMOVED BACK TO SOURCE. UNLESS OTHERWISE NOTED.

D3 PANELBOARD "HVAC" TO BE DEMOLISHED COMPLETE. EXISTING CABLE AND CONDUIT FEEDING FROM EXISTING SWITCHBOARD TO PANELBOARD TO BE DEMOLISHED COMPLETE. ALL EXISTING LOADS TO REMAIN TO BE ROUTED TO NEW PANELBOARD LOCATION. SEE NEW WORK PLAN FOR NEW LOCATION.

D4 EXISTING MECHANICAL EQUIPMENT TO REMAIN. REFER TO MECHANICAL DRAWINGS FOR MORE INFORMATION.

D5 EXISTING FIRE ALARM CONTROL PANEL TO REMAIN.

D6 ALL EXISTING RECEPTACLES, DATA DEVICES, FIRE ALARM DEVICES, FIRE ALARM SYSTEMS, ETC. ON THIS WALL TO BE DEMOLISHED COMPLETE. ALL ASSOCIATED CONDUIT AND WIRING TO BE COMPLETELY REMOVED BACK TO SOURCE. UNLESS OTHERWISE NOTED.

D7 EXISTING MECHANICAL EQUIPMENT TO BE REUSED IN NEW LOCATION. REMOVE ALL WIRING, CONDUIT, DISCONNECTS, ETC. ASSOCIATED WITH UNIT(S) COMPLETELY BACK TO SOURCE. COORDINATE DEMOLITION OF POWER TO ALL HVAC CONTROL DEVICES BEING REMOVED WITH MECHANICAL CONTRACTOR UNLESS OTHERWISE NOTED. COORDINATE WITH MECHANICAL DRAWINGS.

D8 EXISTING IDF RACK TO REMAIN.

SHERMAN CARTER BARNHART ARCHITECTS

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG #23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

FIRST FLOOR PLAN - ELECTRICAL DEMOLTION

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

REVISIONS

No.	Description	Date

SHEET

ED.1

1506.2
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/2/2023 9:26:06 AM

GENERAL NOTES (LIGHTING):

A. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.

B. CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER N.E.C. #310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER N.E.C. #300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN N.E.C #100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.

C. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. ALSO, MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.

D. LOCATE CHAIN-HUNG INDUSTRIAL FIXTURES IN MECHANICAL ROOMS TO AVOID DUCTWORK AND PIPING, TO MAXIMIZE AVAILABLE LIGHT. SPACE AROUND EQUIPMENT, AIR HANDLERS, ETC. TO PROVIDE ADEQUATE LIGHTING TO ALL AREAS OF ROOM. PROVIDE ADDITIONAL FIXTURES OF SAME TYPE AS NEEDED TO FULFILL THIS REQUIREMENT.

E. LOCATE EXIT SIGNS FOR MAXIMUM VIEWING AREA TO IDENTIFY EGRESS PATHS AS INDICATED ON PLANS. COORDINATE LOCATIONS SUCH THAT ARCHITECTURAL FEATURES OR EQUIPMENT FROM OTHER TRADES DO NOT OBSTRUCT VIEW.

F. LUMINAIRES INDICATED WITH MULTI-LEVEL SWITCHING SHALL HAVE SIMILAR LAMPS CONTROLLED TOGETHER, I.E. INBOARD AND OUTBOARD LAMPS OR RIGHT AND LEFT HAND LAMPS.

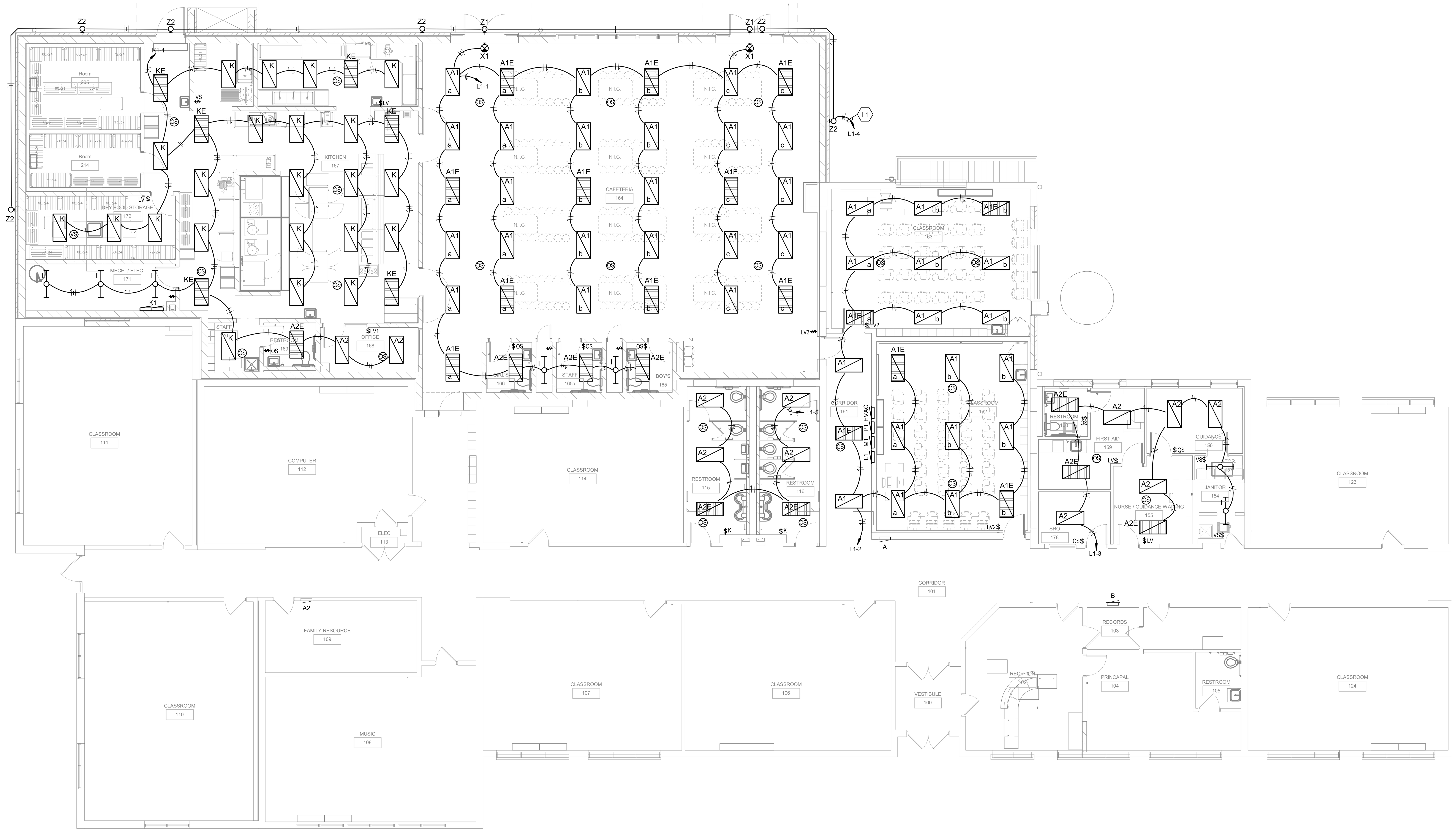
G. ALL LIGHTING FIXTURE LENSES, PARABOLIC LOUVERS, DOWNLIGHTING ALZAK CONES AND "PARACUBE" LOUVERS SHALL BE HANDLED WITH COTTON GLOVES DURING INSTALLATION AND LAMPING TO AVOID FINGERPRINTS OR DIRT DEPOSITS. IT IS PREFERRED THAT FIXTURES BE SHIPPED AND INSTALLED WITH CLEAR PLASTIC BAGS TO PROTECT LOUVERS. AT CLOSE OF PROJECT, AND AFTER CONSTRUCTION AIR FILTERS ARE CHANGED, REMOVE BAGS. ANY LOUVER OR CONE SHOWING DIRT OR FINGER PRINTS SHALL BE CLEANED WITH SOLVENT RECOMMENDED BY THE MANUFACTURER, OR REPLACED AS NECESSARY IN ORDER TO TURN OVER TO THE OWNER NEW FIXTURES AT OCCUPANCY.

H. RECESSED LUMINAIRES SHALL BE SECURED SUCH THAT THE FORCE REQUIRED INSERTING LAMPS, TRIMS, LENSES, LOUVERS, OR DOOR FRAMES DOES NOT SHIFT HOUSING. ALL TRIMS SHALL BE COMPLETELY FLUSH WITH FINISHED CEILINGS AT COMPLETION OF CONSTRUCTION.

I. CONTRACTOR SHALL PROVIDE UNSWITCHED CONDUCTOR TO ALL EXIT SIGNS, EMERGENCY INVERTER BATTERY PACKS, AND NIGHT LIGHTS AS REQUIRED.

KEYNOTES

L1 ROUTE CIRCUIT THROUGH EXTERIOR LIGHTING CONTACTOR. REFER TO DETAIL 3, SHEET E5.1.



1 FIRST FLOOR - LIGHTING
SCALE: 1/8" = 1'-0"

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

FIRST FLOOR PLAN - LIGHTING

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

REVISIONS

No.	Description	Date

SHEET
E1.1

1506.2
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/2/2023 9:26:08 AM

GENERAL NOTES (POWER):

A. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.

B. CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.

C. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.

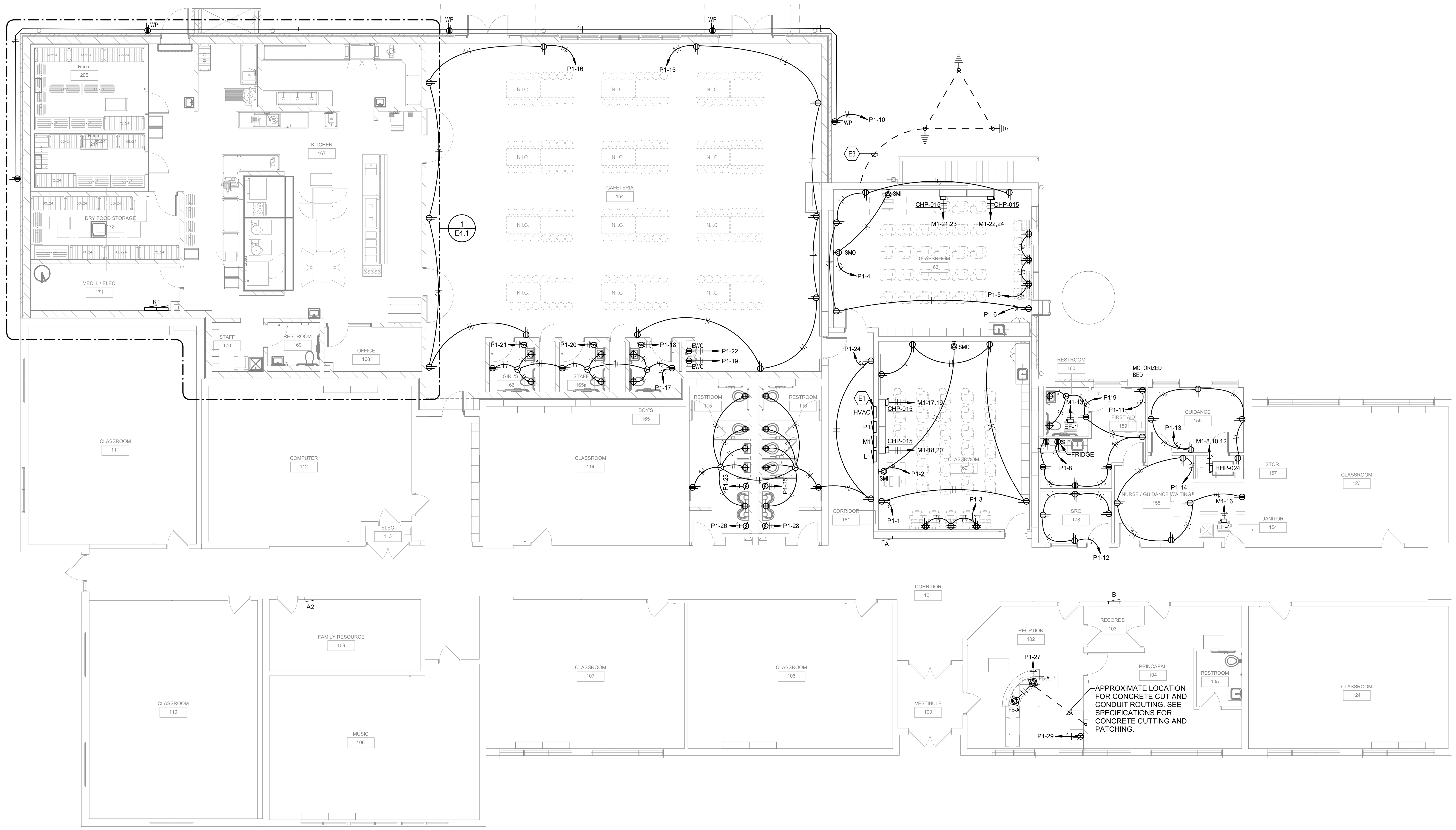
D. RECEPTACLES THAT ARE CONTROLLED BY AN AUTOMATIC MEANS SUCH AS OCCUPANCY SENSOR OR ENERGY MANAGEMENT SYSTEM SHALL BE MARKED IN ACCORDANCE WITH NEC 406.3(E).

E. LOCATIONS OF ELECTRICAL CONNECTIONS AND LOCAL DISCONNECTS SHALL BE COORDINATED WITH MECHANICAL AND PLUMBING CONTRACTORS TO ENSURE ACCESS AND WORKING CLEARANCE IS MAINTAINED PER NEC. NOTIFY OTHER TRADES OF REQUIRED CLEARANCE AREAS TO AVOID ROUTING OF OTHER SYSTEMS IN THESE AREAS. DO NOT INSTALL ELECTRICAL EQUIPMENT OVER EQUIPMENT NAMEPLATES OR ACCESS PANELS OR THROUGH ACCESS/MAINTENANCE CLEARANCES OF EQUIPMENT BY OTHER TRADES.

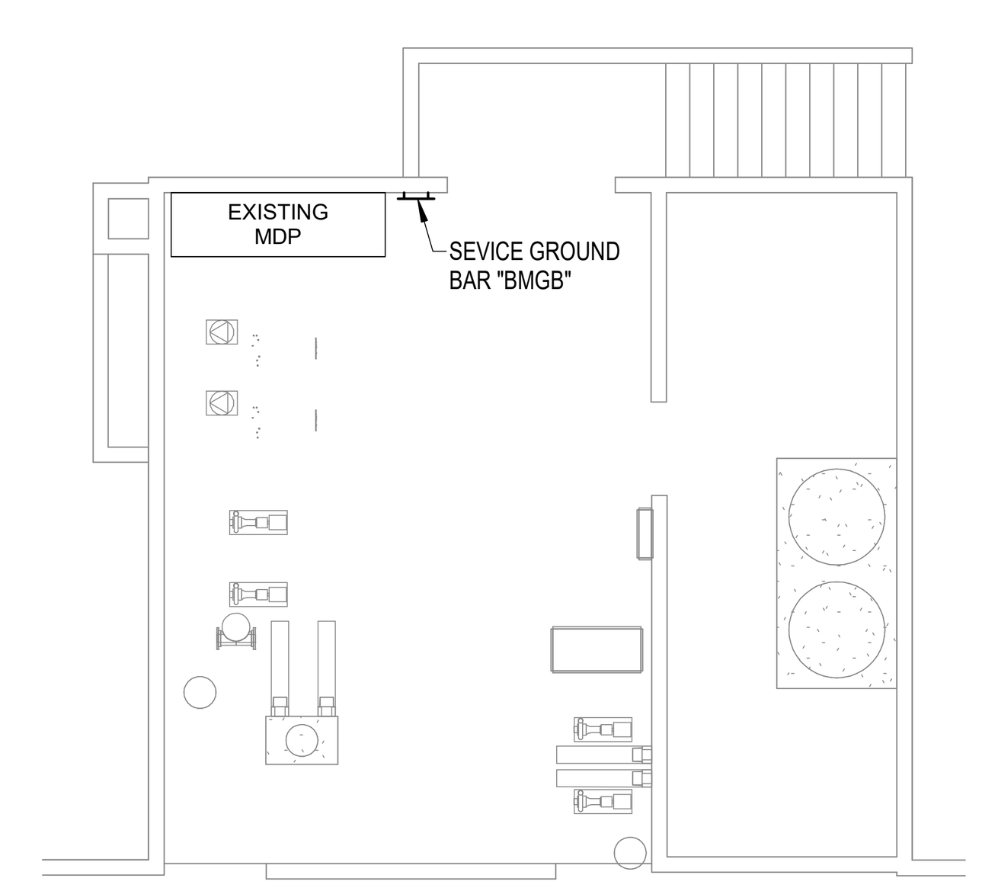
KEYNOTES

E1 NEW PANELBOARD "HVAC". ALL EXISTING BRANCH CIRCUITS TO BE REFED BACK INTO PANELBOARD. PROVIDE NEW BREAKERS IN PANELBOARD TO MATCH DEMOLISHED.

E3 PROVIDE ONE (1) #500 Kcmil GROUND FROM NEW GROUND BAR AT EXISTING MDP TO THREE (3) 5/8" x 10'-0" COPPERWELD CHEMICAL GROUND RODS AS REQUIRED (REFER TO SHEET E5.4). CONTRACTOR SHALL TEST GROUND IMEDANCE LEVEL AND IF NOT 1 Ohm, CONTRACTOR SHALL ADD GROUND RODS AS NECESSARY TO MEET THE REQUIREMENT. FIELD VERIFY BEST LOCATION FOR GORUND RODS ON SITE PRIOR TO CONSTRUCTION. PLACE BARE COPPER BELOW SERVICE SECONDAIRES WHERE RAN IN SAME TRENCH. IN ADDITION, CONNECT TO WATER LINE AT FIRE PROTECTION PIT AS REQUIRED.



1 FIRST FLOOR - POWER
SCALE: 1/8" = 1'-0"



2 BASEMENT - POWER
SCALE: 1/8" = 1'-0"

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY BRIAN K. BAUMGARTLE 23119 LICENSED PROFESSIONAL ENGINEER

CMTA A LEGENCE Company
10411 Meeting Street | Louisville, KY 40059 | 502.326.3085 | cmta.com

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

FIRST FLOOR PLAN - POWER

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

REVISIONS

No.	Description	Date

SHEET

E2.1

1506.2
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/2/2023 9:28:11 AM

GENERAL NOTES (POWER):

A. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.

B. CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.

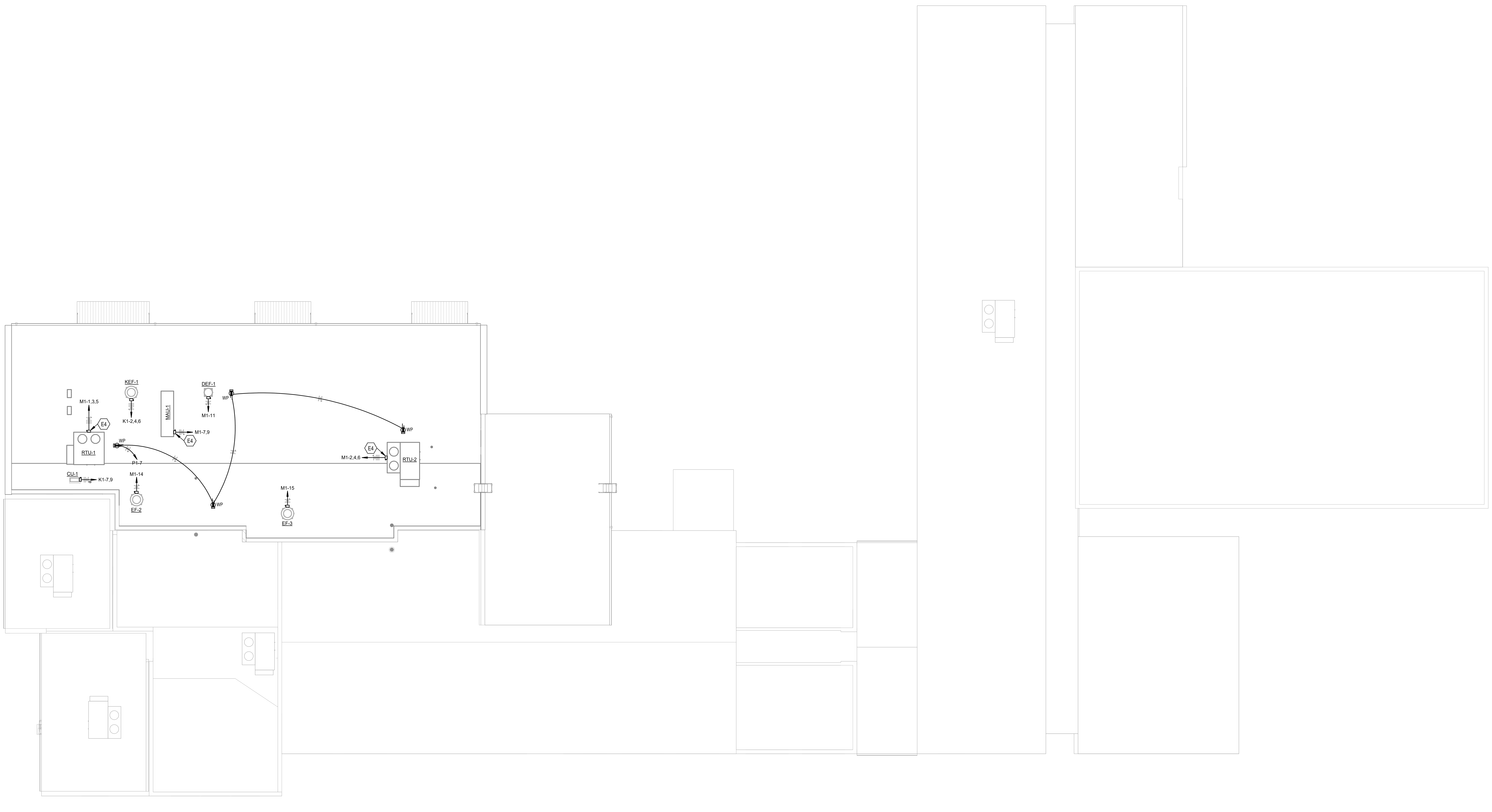
C. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.

D. RECEPTACLES THAT ARE CONTROLLED BY AN AUTOMATIC MEANS SUCH AS OCCUPANCY SENSOR OR ENERGY MANAGEMENT SYSTEM SHALL BE MARKED IN ACCORDANCE WITH NEC 406.3(E).

E. LOCATIONS OF ELECTRICAL CONNECTIONS AND LOCAL DISCONNECTS SHALL BE COORDINATED WITH MECHANICAL AND PLUMBING CONTRACTORS TO ENSURE ACCESS AND WORKING CLEARANCE IS MAINTAINED PER NEC. NOTIFY OTHER TRADES OF REQUIRED CLEARANCE AREAS TO AVOID ROUTING OF OTHER SYSTEMS IN THESE AREAS. DO NOT INSTALL ELECTRICAL EQUIPMENT OVER EQUIPMENT NAMEPLATES OR ACCESS PANELS OR THROUGH ACCESS/MAINTENANCE CLEARANCES OF EQUIPMENT BY OTHER TRADES.

KEYNOTES

E4 ROUTE FEEDER TO PANEL THROUGH INSIDE OF ROOF CURB. DO NOT ROUTE THROUGH ROOF.



1 ROOF PLAN - ELECTRICAL

SCALE: 3/32" = 1'-0"

SHERMAN CARTER BARNHART ARCHITECTS

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ROOF PLAN - ELECTRICAL

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

REVISIONS

No.	Description	Date

SHEET

E2.2

1506.2
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/2/2023 9:28:12 AM

GENERAL NOTES (SYSTEMS):

A. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.

B. CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.

C. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.

D. REFER TO "SYSTEM INSTALLATION MATRIX" (ON SYSTEMS LEGEND SHEET) AND SPECIFICATIONS FOR CONTRACTOR REQUIREMENTS OF EACH SYSTEM.

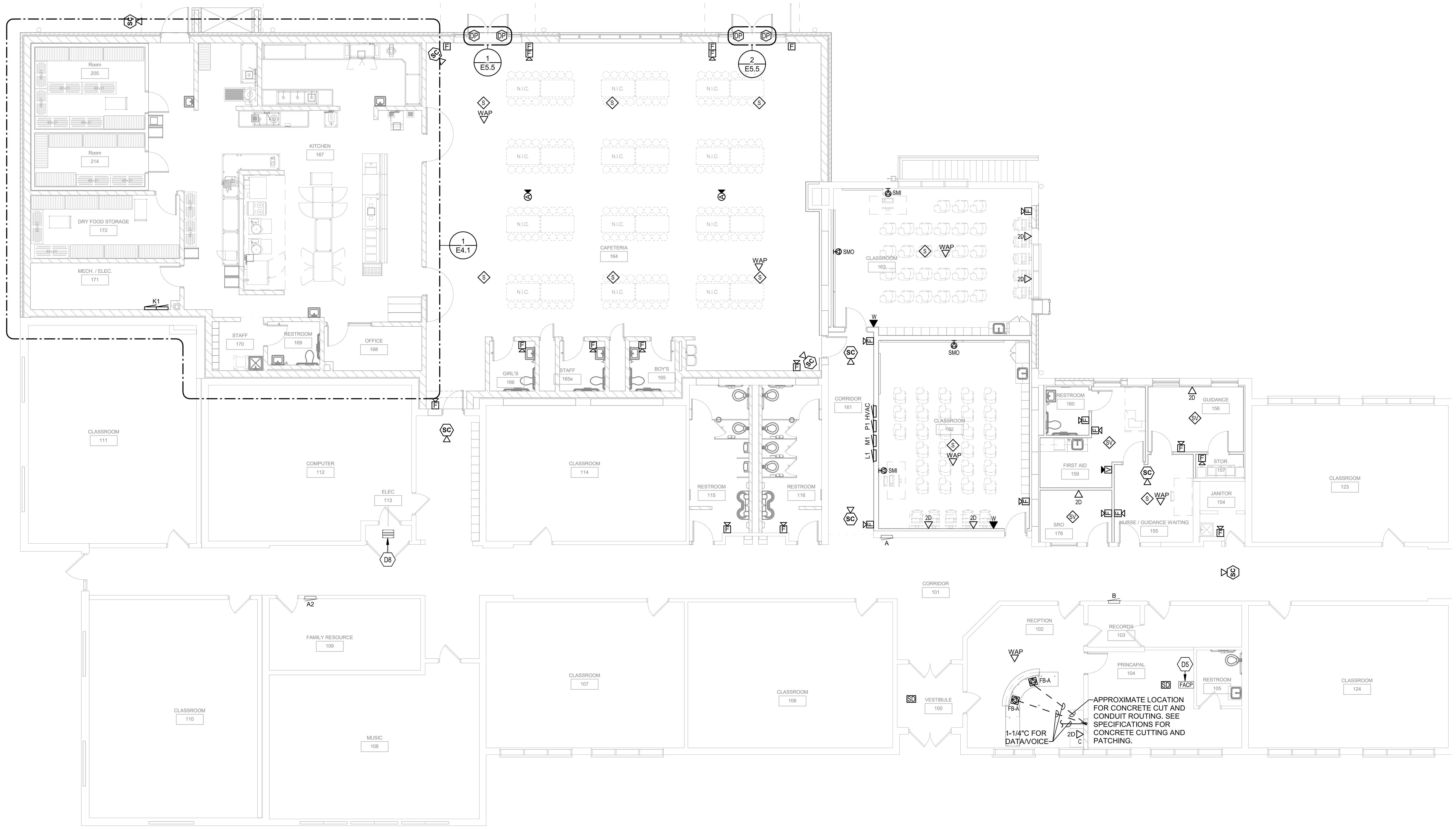
E. THE CONTRACTOR SHALL ROUTE ALL "SYSTEM CONDUIT STUB-UPS" TO THE NEAREST CORRIDOR CABLING PATH (SEE "STUB-UP" DETAILS). REFER TO CABLING PATH INSTALLATION DETAIL FOR ADDITIONAL REQUIREMENTS.

F. CONTRACTOR SHALL PAINT ALL SYSTEMS CONDUIT STUB-UPS LIGHT BLUE FOR SYSTEMS CABLING INTO THE CORRIDOR CABLING PATH. PROVIDE PULL STRINGS IN ALL NEW CONDUIT RUNS FOR SYSTEM CABLING INSTALLATION.

KEYNOTES

D5 EXISTING FIRE ALARM CONTROL PANEL TO REMAIN.

D8 EXISTING IDF RACK TO REMAIN.



1 FIRST FLOOR - SYSTEMS

SCALE: 1/8" = 1'-0"

GENERAL NOTES (COMM RISER):

A. ALL PENETRATIONS THROUGH FLOORS OR WALLS SHALL BE FIRE STOPPED BY APPROVED METHOD. INSTALL FIRE STOP IN ACCORDANCE WITH MANUFATURERES RECOMMENDATIONS.

B. ALL EMPTY CONDUITS SHALL BE PROVIDED WITH PULL STRING.

C. TOTAL DISTANCE FROM HORIZONTAL PATCH PANEL OR CROSS CONNECT TO WORKSTATION OUTLET SHALL NOT EXCEED 275'.

D. PROVIDE #2 AWG GROUND TO ALL RACKS AND WALL MOUNTED EQUIPMENT. REFER TO GROUNDING DIAGRAM AND PLANS FOR GROUNDING BUS REQUIREMENTS.

E. CONTRACTOR SHALL PROVIDE PATCH PANELS, 1 PORT PER EACH JACK WITH 25% SPARE CAPACITY. ALL CABLING SHALL TERMINATE ON RACK-MOUNT PATCH PANELS. ALL HORIZONTAL CABLING SHALL BE FULLY TERMINATED.

F. ALL CABLING SHALL BE ROUTED IN CONDUIT FROM DEVICE TO J-HOOKS.

G. PROVIDE VERTICAL CABLE MANAGEMENT BETWEEN EACH EQUIPMENT RACK AND AT END OF EACH EQUIPMENT RACKS.

H. ALL DROP TYPED SHALL BE EVENLY DITRIBUTED ACROSS THE PATCH PANELS AND ADJACENT TO NEARBY DROPS.

I. PROVIDE TWO (2) CAT6A CABLE TO EACH WIRELESS ACCESS POINT (WAP).

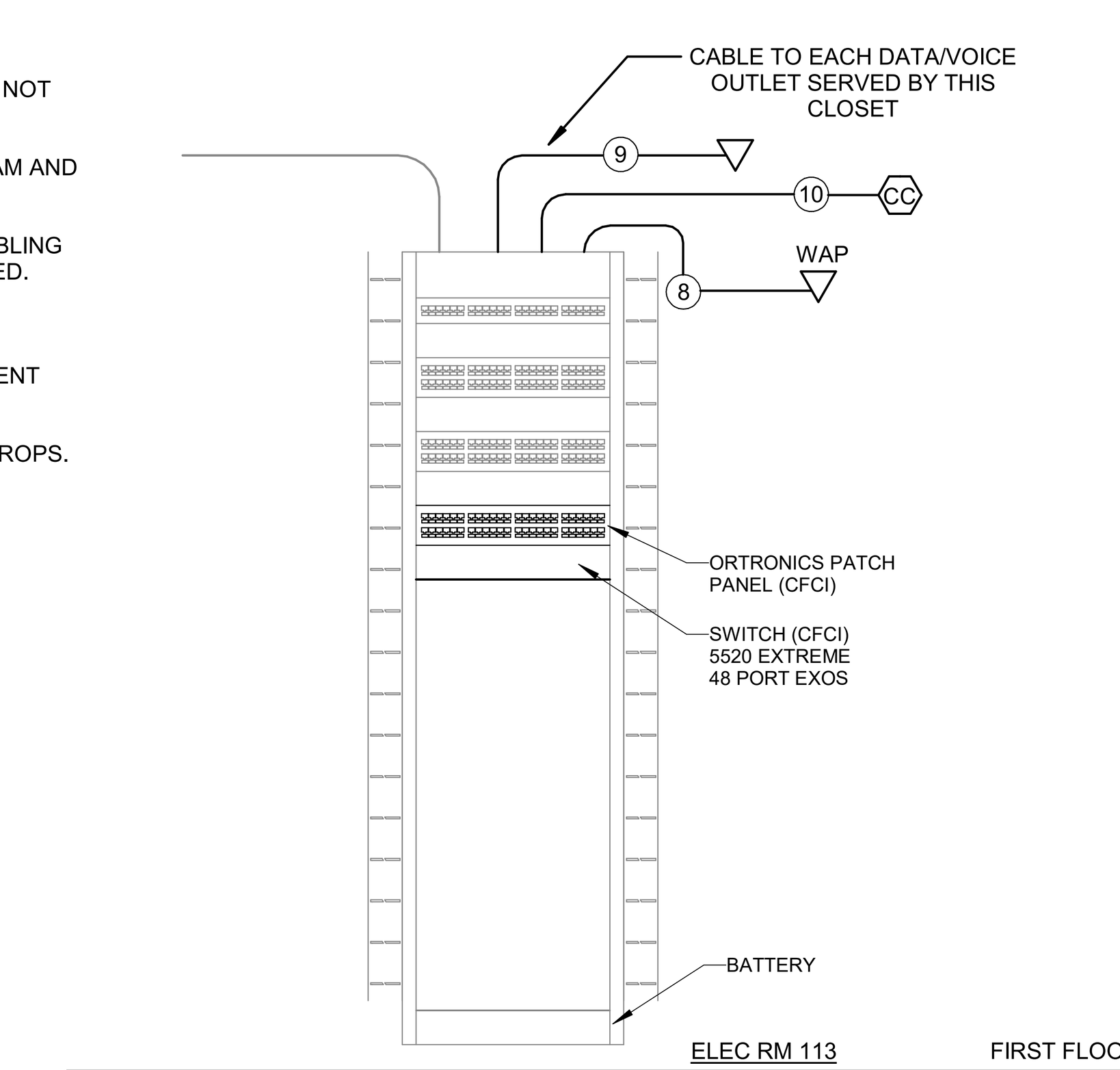
J. PROVIDE CAT 6 CABLING TO ALL DATA/VOICE OUTLETS.

K. PROVIDE RISER RATED LOW-VOLTAGE CABLING.

L. CONTRACTOR TO PROVIDE ALL PATCH CABLES IN CLOSET.

CABLE KEYNOTES: #

1. EXISTING FIBER FROM MDF.
2. PROVIDE TWO (2) CAT6A COPPER CABLE TO EACH WIRELESS ACCESS POINT (WAP).
3. PROVIDE ONE (1) CAT6 COPPER CABLE PER EACH DAT/VOICE JACK.
4. PROVIDE ONE (1) CAT6 COPPER CABLE TO EACH CCTV.



2 COMMUNICATIONS RISER DIAGRAM

NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY BRIAN K. BAUMGARTLE 23119 LICENSED PROFESSIONAL ENGINEER

CMTA A LEGENCE Company
10411 Meeting Street | Louisville, KY 40059 | 502.326.3085 | cmta.com

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

FIRST FLOOR PLAN - SYSTEMS

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

REVISIONS

No.	Description	Date

SHEET

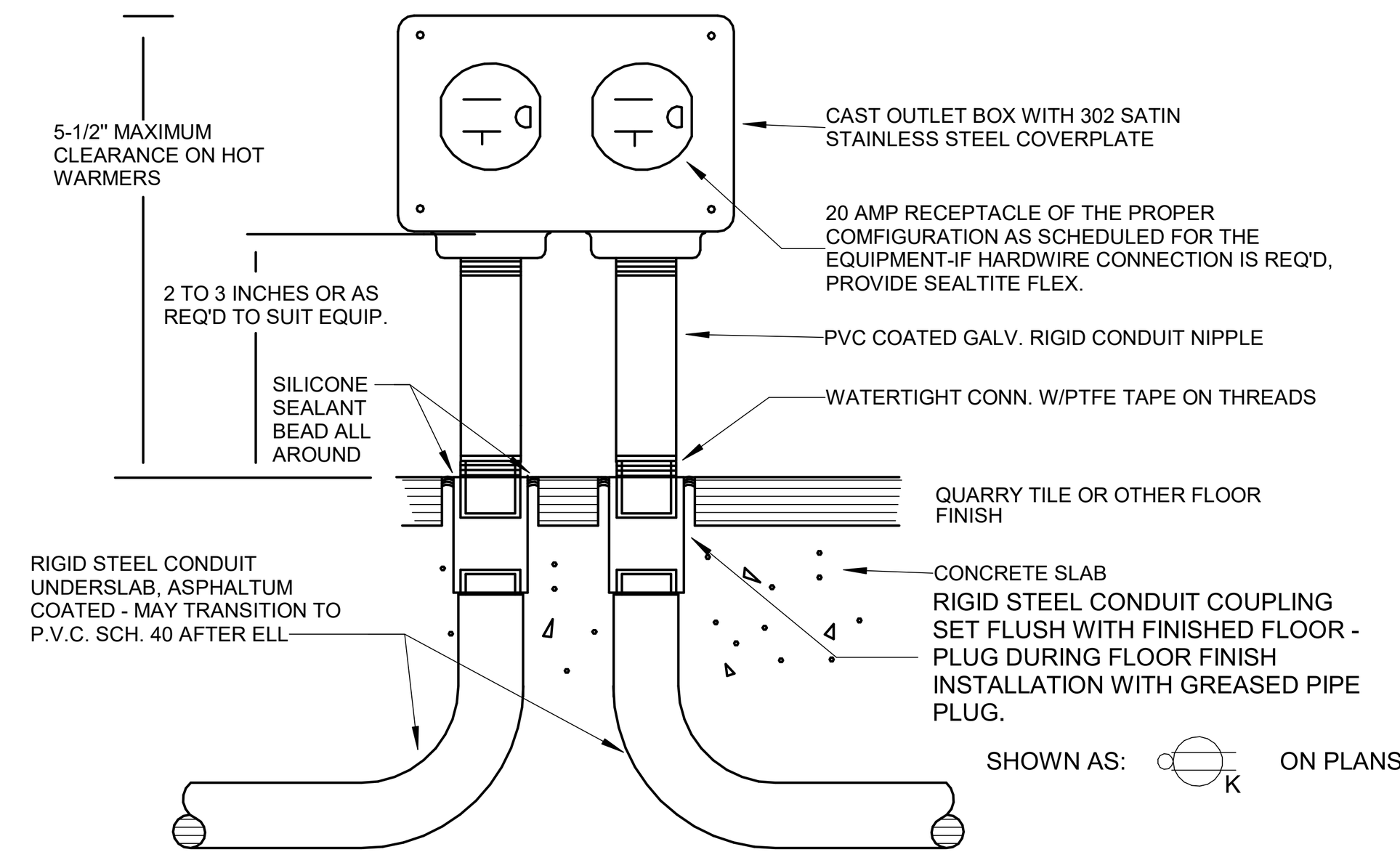
E3.1

1506.2
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/2/2023 9:28:14 AM

ELEC - KITCHEN EQUIPMENT CONNECTION SCHEDULE

EQUIP ID	DESCRIPTION	ELECTRICAL ROUGH-IN: CONNECTION TYPE	MOUNTING HEIGHT	VOLTAGE	POLES	HP	POWER (kVA)	REMARKS
K-1	CASHIER COUNTER	FLOOR RECEPTACLE		120	1		0.36 kVA	
K-3	COLD FOOD COUNTER	RECEPTACLE		120	1		0.18 kVA	
K-4	HOT FOOD COUNTER	RECEPTACLE		120	1		0.18 kVA	
K-5	MILK COOLER	RECEPTACLE		120	1		0.18 kVA	
K-8	GARBAGE DISPOSER	DIRECT		120	1		0.18 kVA	
K-10	DISHWASHER	DIRECT		120	1		0.18 kVA	
K-13	ICE MAKER & BIN	DIRECT		120	1		0.18 kVA	
K-18	PASS THRU REFRIGERATOR	RECEPTACLE		120	1		0.18 kVA	
K-19	EXHAUST HOOD SYSTEM	DIRECT		120	1		0.50 kVA	
K-20	COMBI OVEN (DOUBLE STACK)	DIRECT		120	1		0.18 kVA	
K-22	OVEN, MICROWAVE	RECEPTACLE		208	2		0.18 kVA	
K-23	OVEN, MICROWAVE	RECEPTACLE		208	2		0.18 kVA	
K-25	CONVECTION OVEN	DIRECT		120	1		0.18 kVA	
K-26	12 GAL. STEAM JACKETED KETTLE	DIRECT		120	1		0.18 kVA	
K-27	ELECTRIC RANGE	RECEPTACLE		208	2		0.18 kVA	
K-28	FOOD PROCESSOR	RECEPTACLE		120	1		0.18 kVA	
K-30	GARBAGE DISPOSER	DIRECT		120	1		0.18 kVA	
K-32	CUTER/MIXER, VERTICAL	RECEPTACLE		120	1		0.18 kVA	
K-38	FOOD SLICER	RECEPTACLE		120	1		0.18 kVA	

ELECTRICAL CONTRACTOR SHALL REFER TO SPECIFICATION 114000, FOOD SERVICE EQUIPMENT, FOR ADDITIONAL REQUIREMENTS.



2 KITCHEN TYPE FLOOR STUB-UP OUTLET

NO SCALE

GENERAL NOTES (KITCHEN):

A. PROVIDE BREAKER LOCK-OUT PROVISIONS IN PANELS FOR BREAKERS THAT SERVE HARD-WIRED KITCHEN EQUIPMENT CONNECTIONS.

B. KITCHEN PLANS ARE BASED UPON COORDINATION WITH THE KITCHEN DESIGN CONSULTANT'S DRAWINGS. ALL ROUGH-INS AND FINAL CONNECTIONS SHALL BE VERIFIED WITH KITCHEN EQUIPMENT SHOP DRAWINGS AND ARCHITECTURAL PLANS AND ELEVATIONS PRIOR TO CONSTRUCTION.

C. FOR ALL CIRCUITS SERVING RECEPTACLES AND EQUIPMENT IN KITCHEN AND SERVING AREAS, PROVIDE "GFCI" TYPE CIRCUIT BREAKERS FOR THOSE CIRCUITS. FOR ALL RECEPTACLES THAT ARE CONNECTED TO "GFCI" CIRCUIT BREAKERS, PROVIDE PERMANENT LABELS ON THE RECEPTACLE COVERPLATE INDICATING "GFCI" PROTECTED CIRCUIT".

D. PROVIDE #302 STAINLESS STEEL COVERPLATES ON ALL OUTLETS LOCATED ON A WALL WITH STAINLESS STEEL COVERINGS. VERIFY LOCATIONS OF THESE STAINLESS STEEL WALLS WITH THE KITCHEN VENDOR DRAWINGS / SHOP DRAWINGS.

E. REFER TO KITCHEN ELECTRICAL CONNECTIONS SCHEDULES FOR MOUNTING HEIGHTS OF RECEPTACLES AND JUNCTION BOXES.

F. VERIFY EXACT OUTLET NEMA CONFIGURATIONS WITH EQUIPMENT SUPPLIER PRIOR TO CONSTRUCTION.

KEYNOTES

E2 EMERGENCY PUSH BUTTON. PROVIDE CONNECTION BETWEEN HOOD FIRE SUPPRESSION SYSTEM AND BUILDING FIRE ALARM SYSTEM FOR MONITORING. REFER TO EMERGENCY SHUT-OFF WIRING DIAGRAM.

S1 DOOR CHIME AND STROBE. PROVIDE ALL WIRE AND CONDUIT AS REQUIRED FOR CONNECTIONS TO DOOR BELL PUSH BUTTON STATION ON EXTERIOR. COORDINATE ALL REQUIREMENTS WITH ACCESS CONTROL VENDOR PRIOR TO CONSTRUCTION.

GENERAL NOTES (POWER/SYSTEMS):

A. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.

B. CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.

C. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.

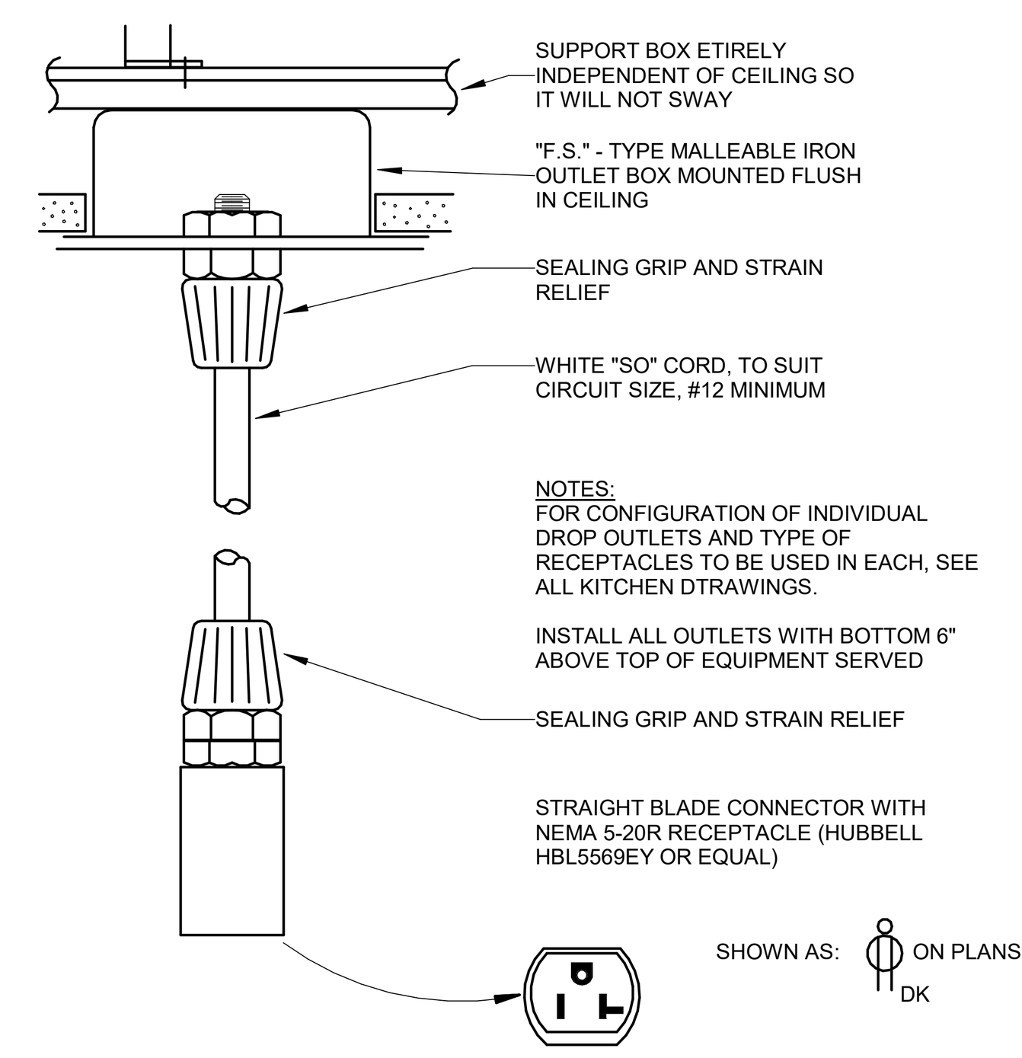
D. RECEPTACLES THAT ARE CONTROLLED BY AN AUTOMATIC MEANS SUCH AS OCCUPANCY SENSOR OR ENERGY MANAGEMENT SYSTEM SHALL BE MARKED IN ACCORDANCE WITH NEC 406.3(E).

E. LOCATIONS OF ELECTRICAL CONNECTIONS AND LOCAL DISCONNECTS SHALL BE COORDINATED WITH MECHANICAL AND PLUMBING CONTRACTORS TO ENSURE ACCESS AND WORKING CLEARANCE IS MAINTAINED PER NEC. NOTIFY OTHER TRADES OF REQUIRED CLEARANCE AREAS TO AVOID ROUTING OF OTHER SYSTEMS IN THESE AREAS. DO NOT INSTALL ELECTRICAL EQUIPMENT OVER EQUIPMENT NAMEPLATES OR ACCESS PANELS OR THROUGH ACCESS/MAINTENANCE CLEARANCES OF EQUIPMENT BY OTHER TRADES.

F. REFER TO "SYSTEM INSTALLATION MATRIX" (ON SYSTEMS LEGEND SHEET) AND SPECIFICATIONS FOR CONTRACTOR REQUIREMENTS OF EACH SYSTEM.

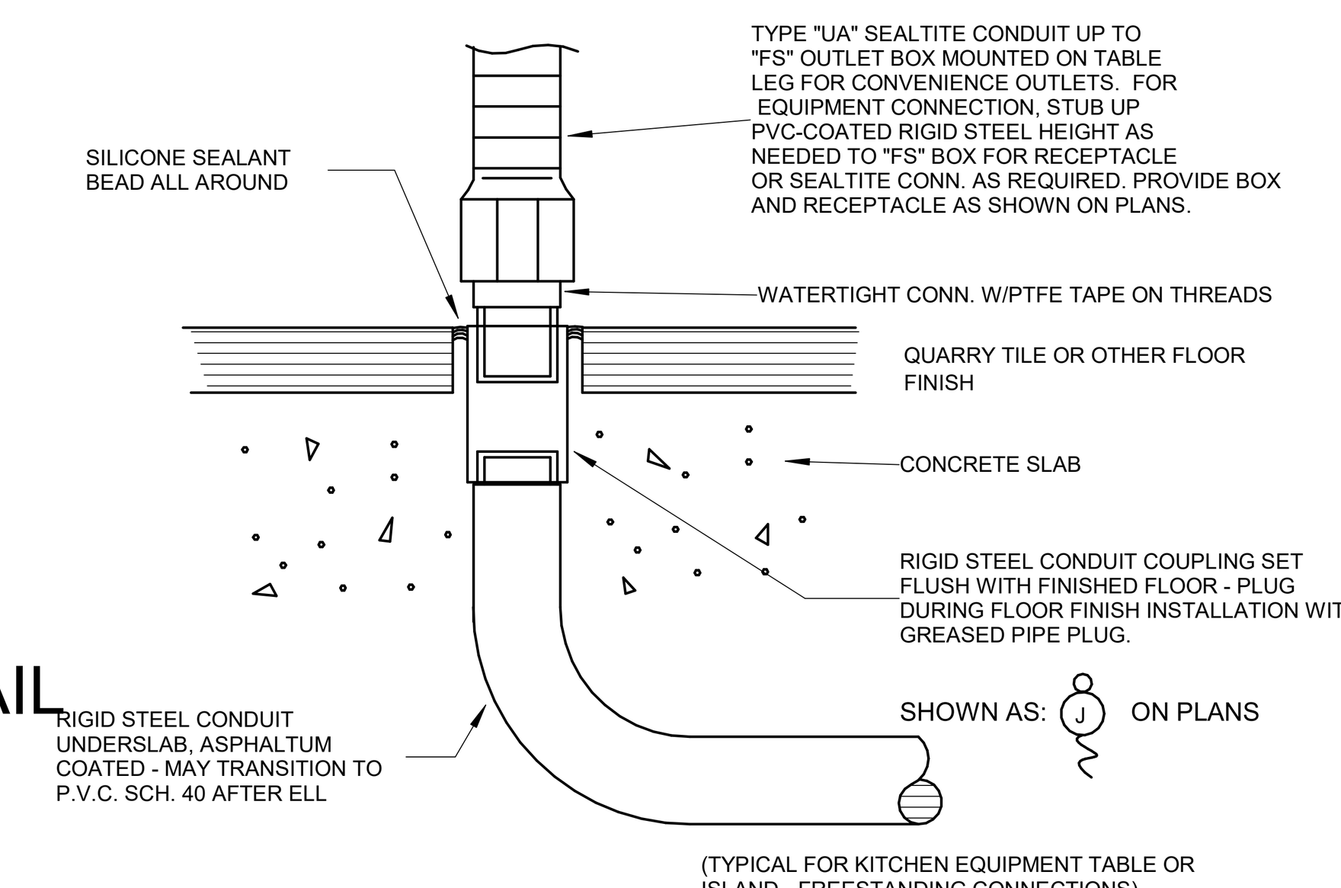
G. THE CONTRACTOR SHALL ROUTE ALL "SYSTEM CONDUIT STUB-UPS" TO THE NEAREST CORRIDOR CABLING PATH (SEE "STUB-UP" DETAILS). REFER TO CABLING PATH INSTALLATION DETAIL FOR ADDITIONAL REQUIREMENTS.

H. CONTRACTOR SHALL PAINT ALL SYSTEMS CONDUIT STUB-UPS LIGHT BLUE FOR SYSTEMS CABLING INTO THE CORRIDOR CABLING PATH. PROVIDE PULL STRINGS IN ALL NEW CONDUIT RUNS FOR SYSTEM CABLING INSTALLATION.



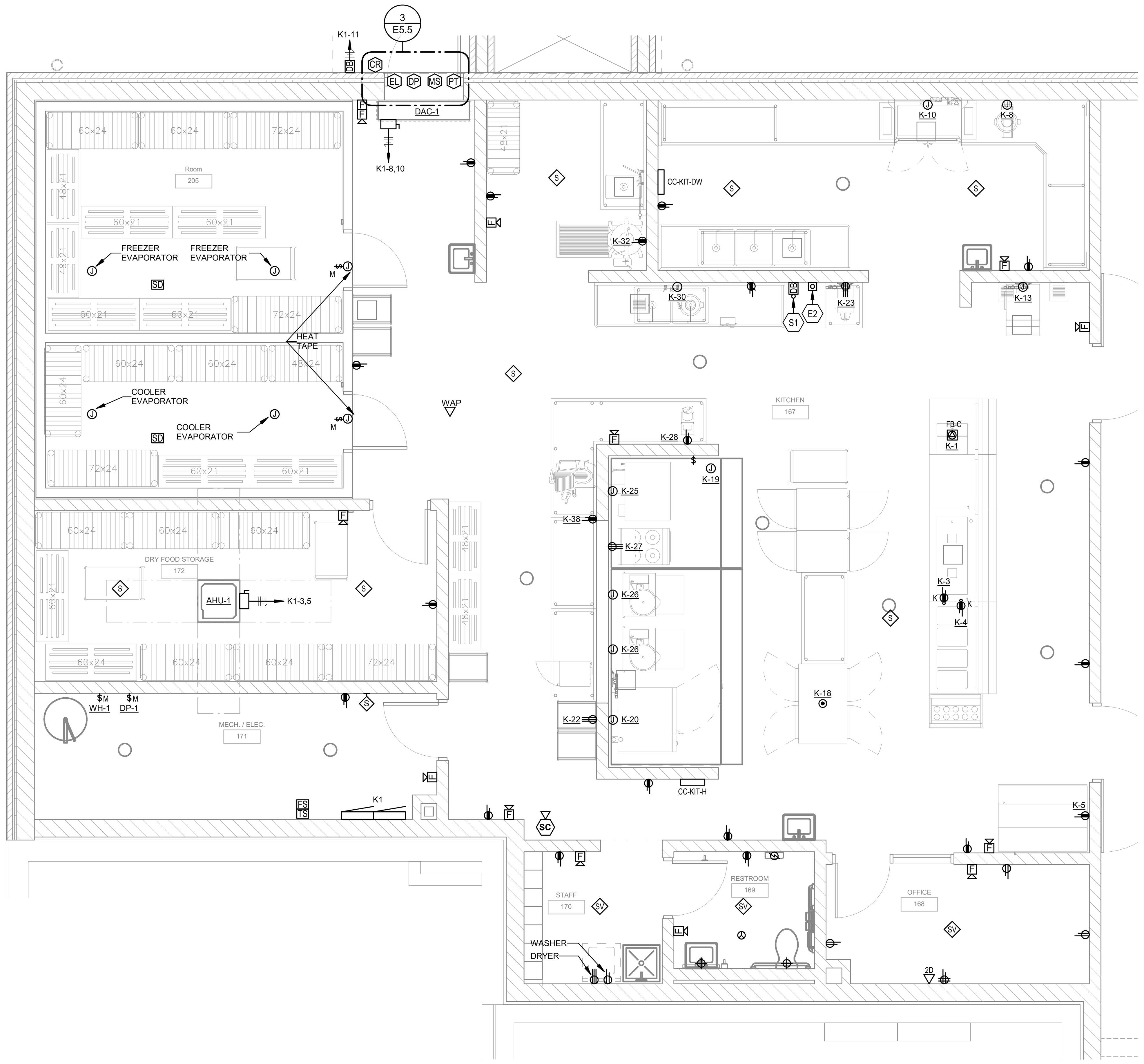
6 TYPICAL CEILING OUTLET DROP DETAIL

NO SCALE



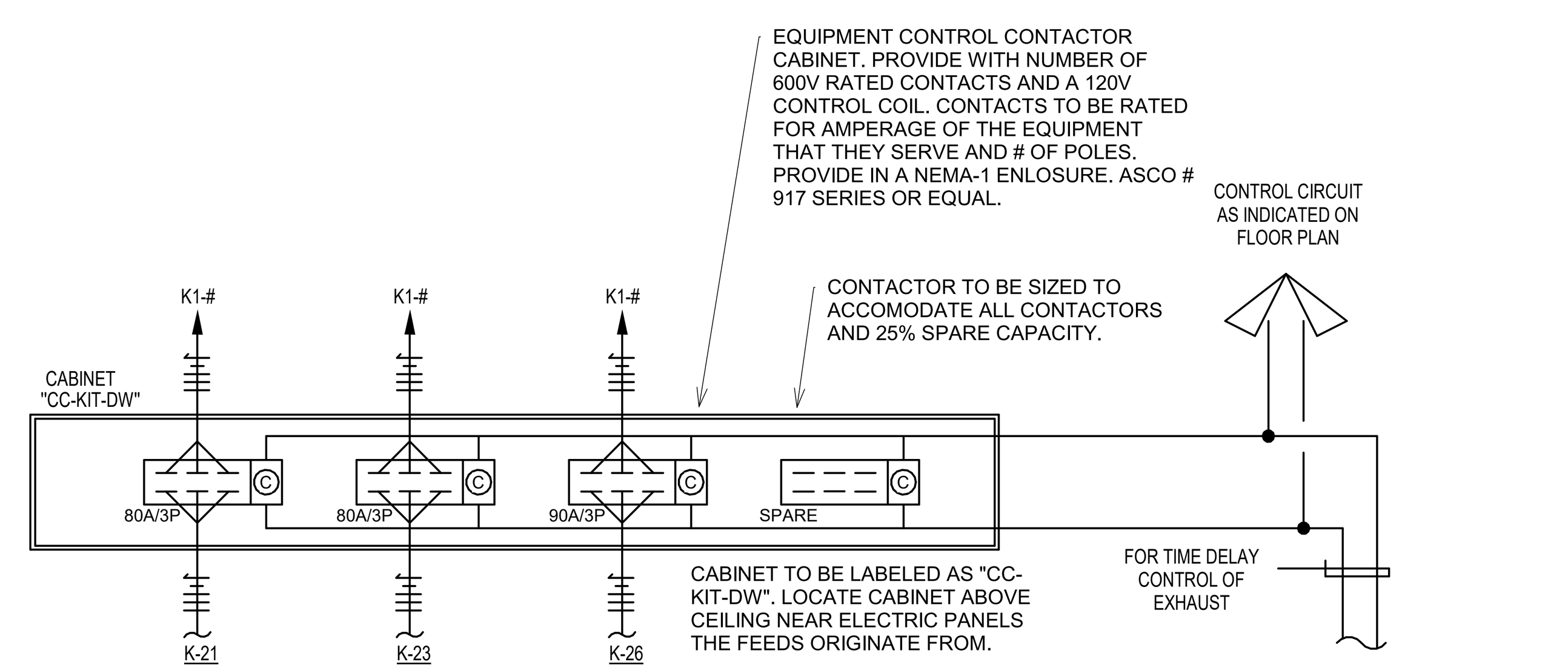
3 FLOOR OUTLET COUPLING TO FLEX STUB-UP DETAIL

NO SCALE



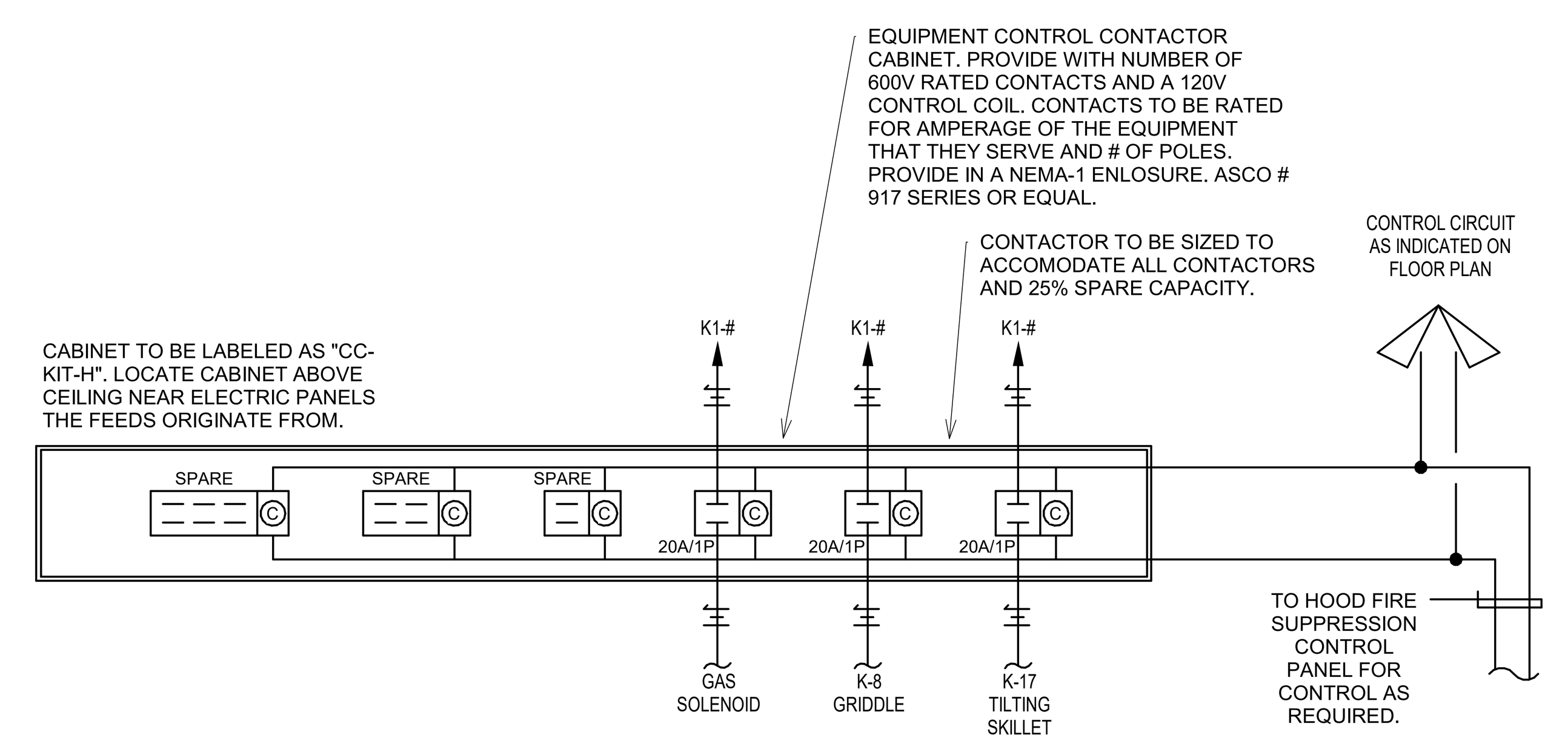
1 ENLARGED KITCHEN PLAN - ELECTRICAL

SCALE: 1/4" = 1'-0"



4 KITCHEN DISHWASHER EQUIPMENT CONTROL SCHEMATIC

NO SCALE



5 KITCHEN HOOD CONTROL SCHEMATIC (FOR TYPE 1 HOOD)

NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY
BRIAN K. BAUMGARTLE
23119
LICENSED PROFESSIONAL ENGINEER

CMTA
A LEGENCE Company
10411 Meeting Street | Louisville, KY 40059 | 502.326.3085 | cmta.com

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ENLARGED KITCHEN PLAN - ELECTRICAL

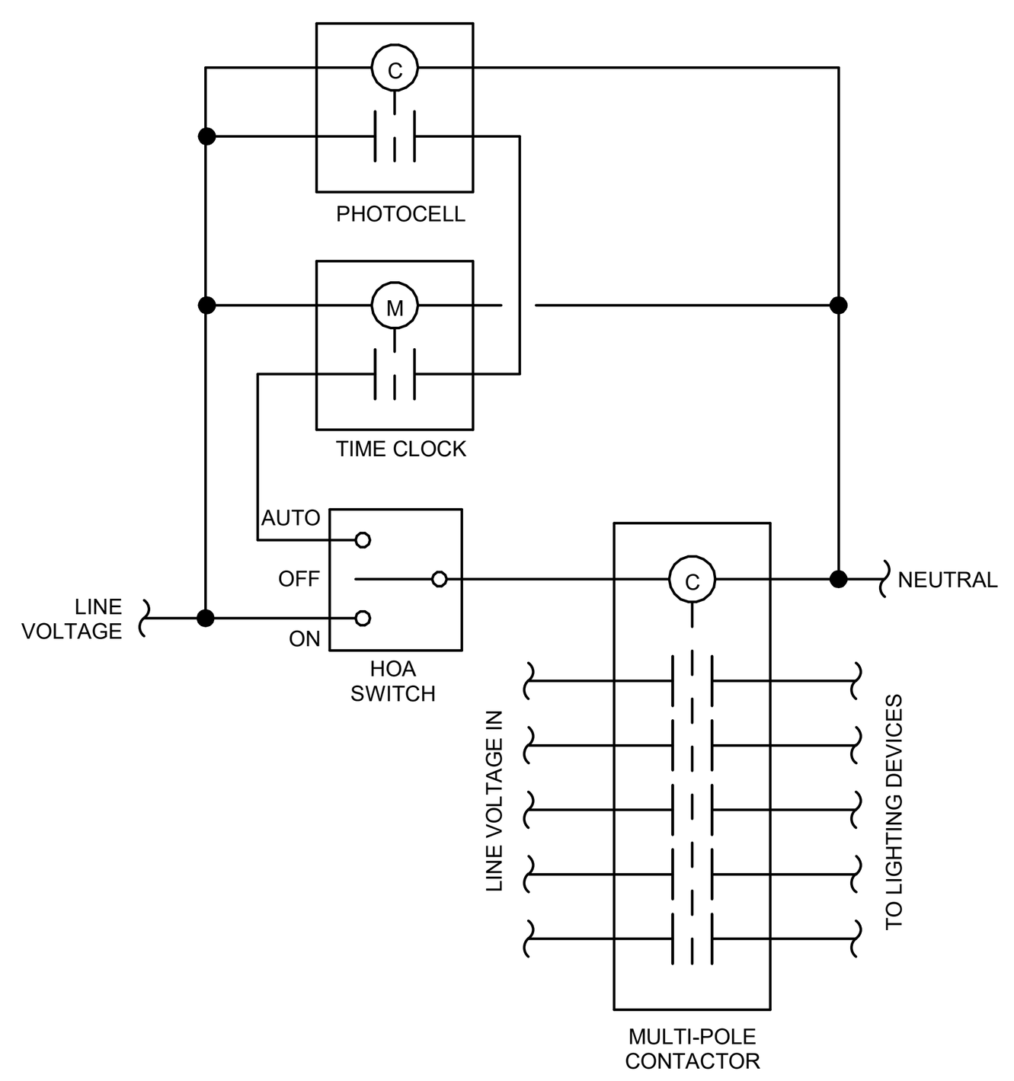
JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

REVISIONS

No.	Description	Date

SHEET

E4.1

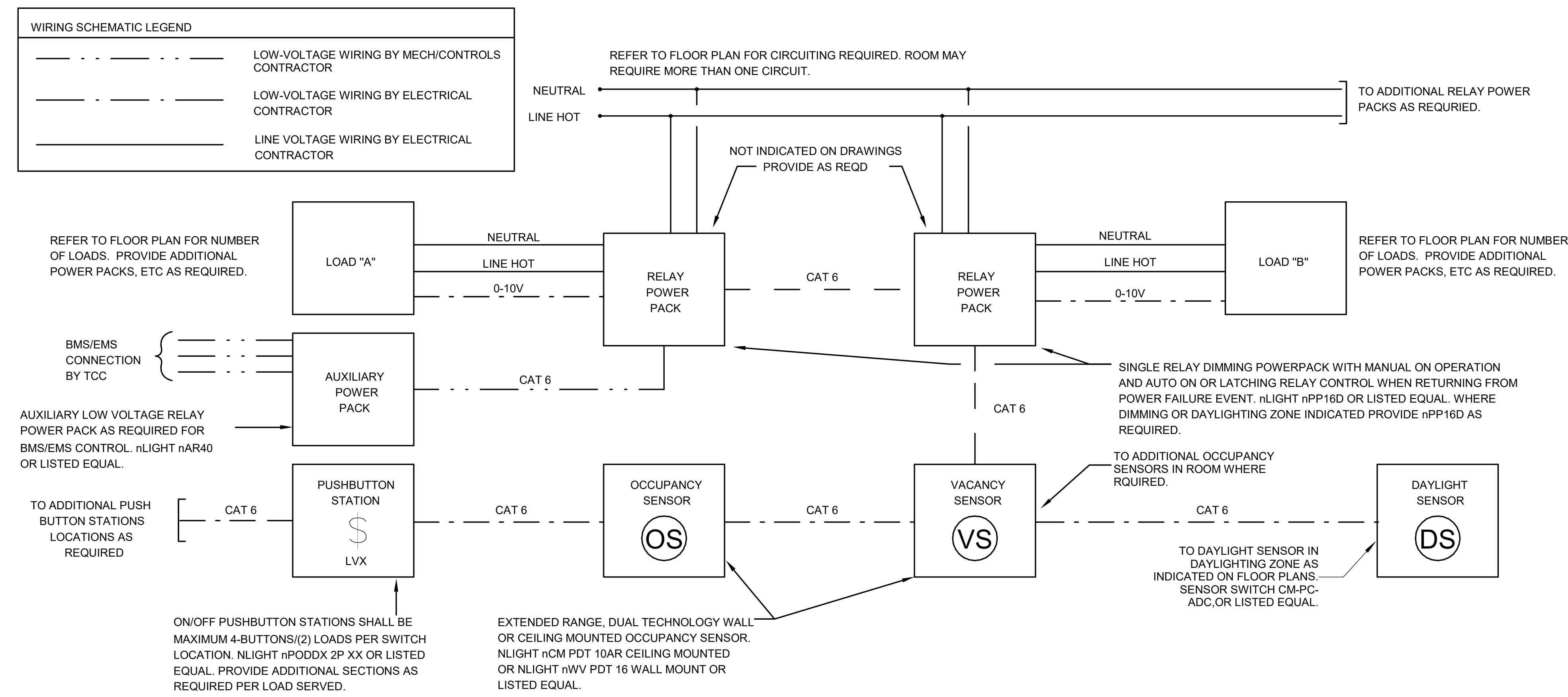


NOTES:

1. PROVIDE QUANTITY OF CONTATORS AS REQUIRED.
2. INSTALL TIME CLOCK AND CONTACTOR(S) IN HINGED ENCLOSURE RATED FOR ENVIRONMENT INSTALLED.
3. HOA TO BE OPERABLE WITHOUT OPENING ENCLOSURE.
4. INSTALL PHOTOCELL ON ROOF FACING NORTH UNLESS OTHERWISE NOTED ON PLANS.

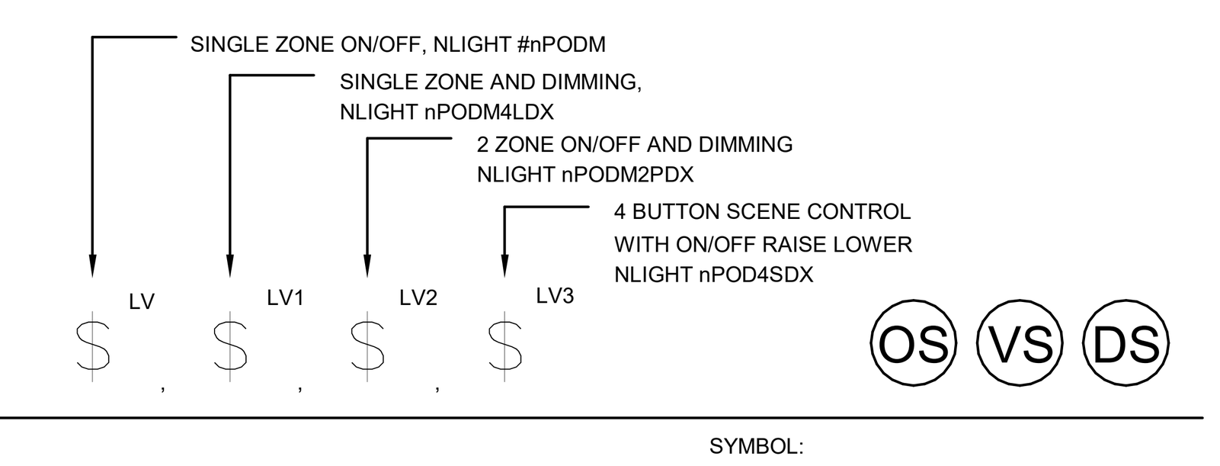
3 LIGHTING CONTACTOR DETAIL

NO SCALE



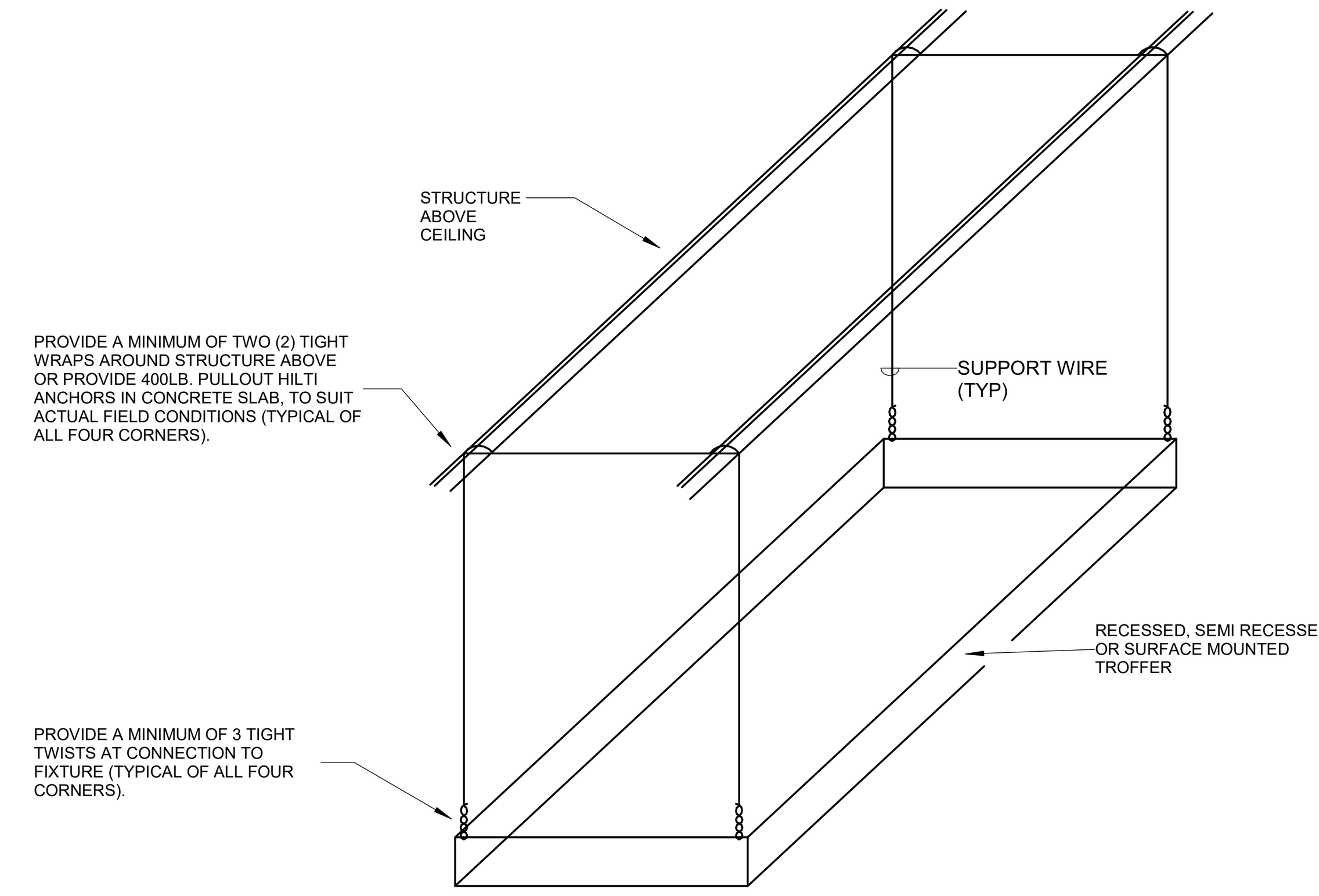
OCCUPANCY/VACANCY/DAYLIGHT SENSOR GENERAL NOTES :

1. SENSOR SHALL NOT BE SUPPORTED BY CEILING TILE. PROVIDE MOUNTING BRACKET TO SUPPORT SENSOR FROM CEILING GRID.
2. VERIFY ALL WIRING REQUIREMENTS WITH MANUFACTURER OF OCCUPANCY SENSOR PRIOR TO ROUGH-IN. THIS DIAGRAM IS MEANT TO BE ILLUSTRATIVE ONLY.
3. ALL POWER PACKS TO BE LOCATED IN CONCEALED LOCATIONS ABOVE ACCESSIBLE CEILINGS.
4. ALL UNITS TO BE DUAL TECHNOLOGY SENSORS WITH POWER PACKS.
5. PROVIDE J-HOOKS ON 2' CENTERS ABOVE CEILING FOR ALL CONTROL CABLING INDICATED BETWEEN RELAYS.
6. CONTRACTOR SHALL PROVIDE AN EXTRA 25' OF CONTROL WIRING COILED UP ABOVE CEILING AT OCCUPANCY AND VACANCY SENSORS.
7. OCCUPANCY SENSORS, RELAY POWER PACKS, WALL BUTTON STATIONS AND ALL CABLING SHALL BE C.F.C.I.. CABLING SHALL BE PINK.
8. WHERE MULTIPLE CIRCUITS SERVE ONE AREA, CONTRACTOR SHALL PROVIDE ADDITIONAL RELAY PACKS AS REQUIRED TO CONTROL ALL CIRCUITS IN ROOM TOGETHER. REFER TO MANUFACTURER'S WIRING DIAGRAMS FOR WIRING REQUIREMENTS.
9. WHERE MULTIPLE SENSORS AND MULTIPLE POWER PACKS ARE REQUIRED IN ONE ROOM, CONTRACTOR SHALL CONNECT SENSORS AND POWER PACKS SUCH THAT MOTION DETECTION BY ANY SENSOR IN THE ROOM SHALL ALLOW ALL CIRCUITS IN THE ROOM TO OPERATE. PROVIDE ALL ACCESSORIES AND WIRE DEVICES PER MANUFACTURER'S REQUIREMENTS FOR OPERATION AS DESCRIBED.
10. SYSTEM SHALL BE SENSOR SWITCH nLIGHT, WATTSTOPPER DLM, COOPER CONTROLS OR EQUAL. SYSTEM SHALL BE PROVIDED, WIRED AND CONTROLLED AS A COMPLETE AND OPERABLE SYSTEM.
11. OCC SENSORS SHALL BE DUAL TECHNOLOGY (PIR AND ULTRASONIC) CEILING OR WALL TYPE. WHERE INDICATED AS WALL TYPE, PROVIDE WITH WITH RECESS BACKBOX, STUB-OUT AND GROMMETED COVERPLATE FOR CABLING. PROVIDE WITH ADDITIONAL EMS RELAY FOR BUILDING MANAGEMENT.
12. CAT 6 CABLING SHALL BE PROVIDED PER DIVISION 27 SPECIFICATIONS.
13. CONTRACTOR SHALL PROVIDE REMOTE TEST SWITCH AT ACCESSIBLE LOCATION IN NEAREST CEILING SURFACE WHEREVER UL924 TYPE DEVICES ARE PROVIDED.
14. PROVIDE 0-10V WIRING WHERE DIGITAL/DIMMING SWITCHES ARE INDICATED.



1 OCCUPANCY/VACANCY/DAYLIGHT SENSOR LIGHTING CONTROL WIRING DIAGRAM

NO SCALE



GENERAL TROFFER SUPPORT DETAIL NOTES:

1. SUPPORT WIRES SHALL BE GALVANIZED REGULAR COATING, SOFT TEMPER, 0.1055 INCHES IN DIAMETER (12 GAGE).
2. ALTERNATELY, CONTRACTOR MAY SUPPORT FIXTURES WITH SINGLE WIRE FROM ALL FOUR CORNERS OF FIXTURE PER SPECIFICATIONS WITH NUMBER OF TWISTS AT FIXTURE AND NUMBER OF WRAPS AROUND STRUCTURE INDICATED IN THIS DETAIL.

2 TROFFER SUPPORT DETAIL

NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG #23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ELECTRICAL DETAILS

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

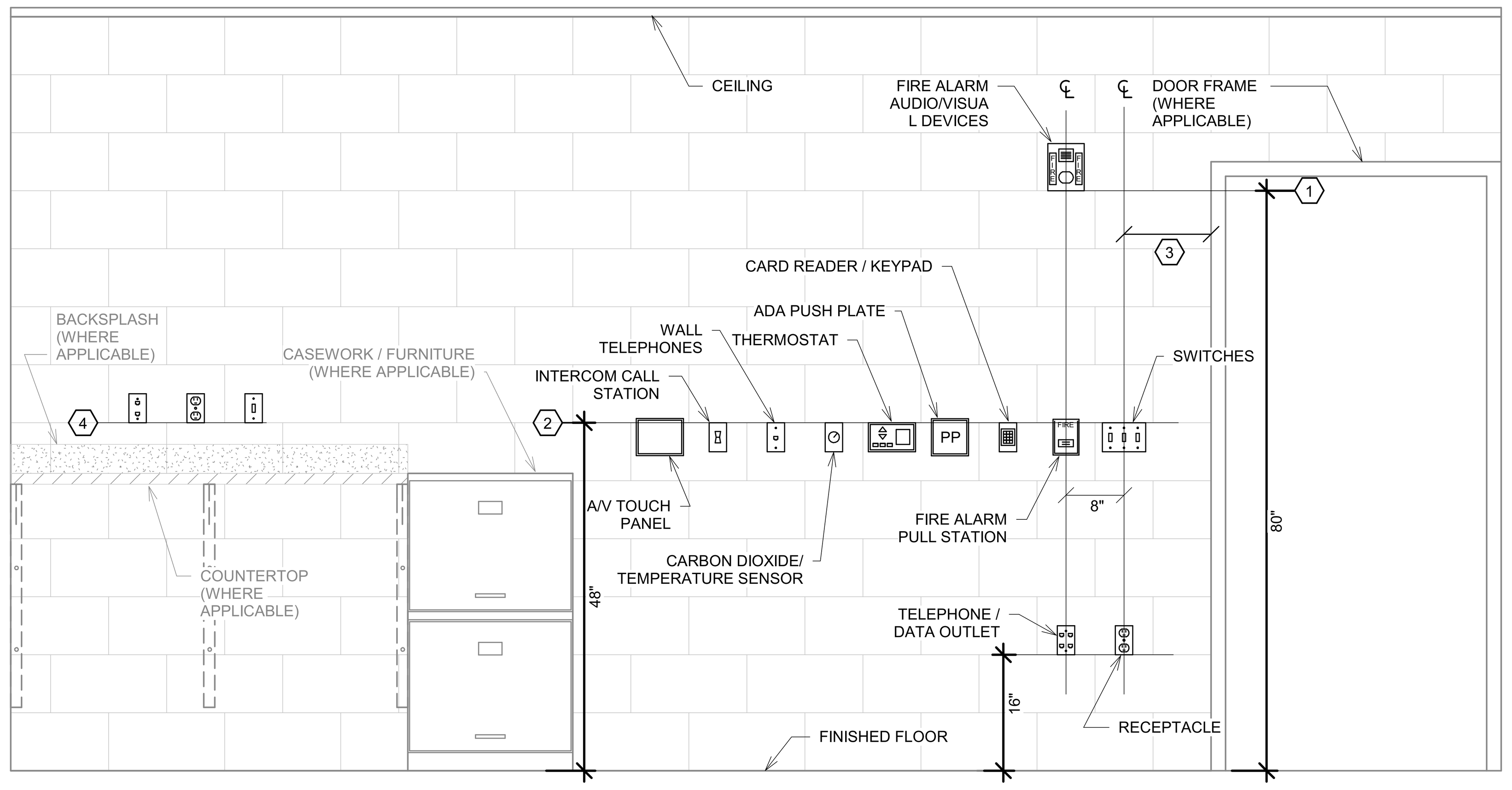
REVISIONS

No.	Description	Date

SHEET

E5.1

1506.2
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/2/2023 9:28:16 AM



DEVICE MOUNTING DETAIL - GENERAL NOTES:

A. WHERE DEVICES OF ANY DISCIPLINE ARE LOCATED IN THE SAME GENERAL AREA ON THE PLANS AND ARE SHOWN TO BE MOUNTED AT A SIMILAR HEIGHT, ALIGN HORIZONTALLY ALONG TOP OF DEVICE BACKBOX (AS SHOWN IN DETAIL AND DESCRIBED IN KEY NOTE #2).

B. WHERE DEVICES OF ANY DISCIPLINE ARE LOCATED IN THE SAME GENERAL AREA ON THE PLANS AND ARE SHOWN MOUNTED AT DIFFERENT HEIGHTS, ALIGN VERTICALLY ALONG THE CENTERLINE OF THE DEVICE BACKBOX (AS SHOWN IN DETAIL).

C. FOR ANY WALL OTHER THAN PAINTED GYPSUM BOARD OR CMU, DEVICE LOCATIONS MUST BE FIELD APPROVED BY ENGINEER OR ARCHITECT PRIOR TO INSTALLATION OF FINISHES.

DEVICE MOUNTING DETAIL - KEY NOTES:

1. MOUNT VISUAL NOTIFICATION APPLIANCES SO THAT ENTIRE LENS IS BETWEEN 80" AND 96" AFF. IF CEILING IS TOO LOW FOR DEVICE TO BE MOUNTED ABOVE 80", MOUNT SO THAT THE LENS IS WITHIN 6" OF FINISHED CEILING.

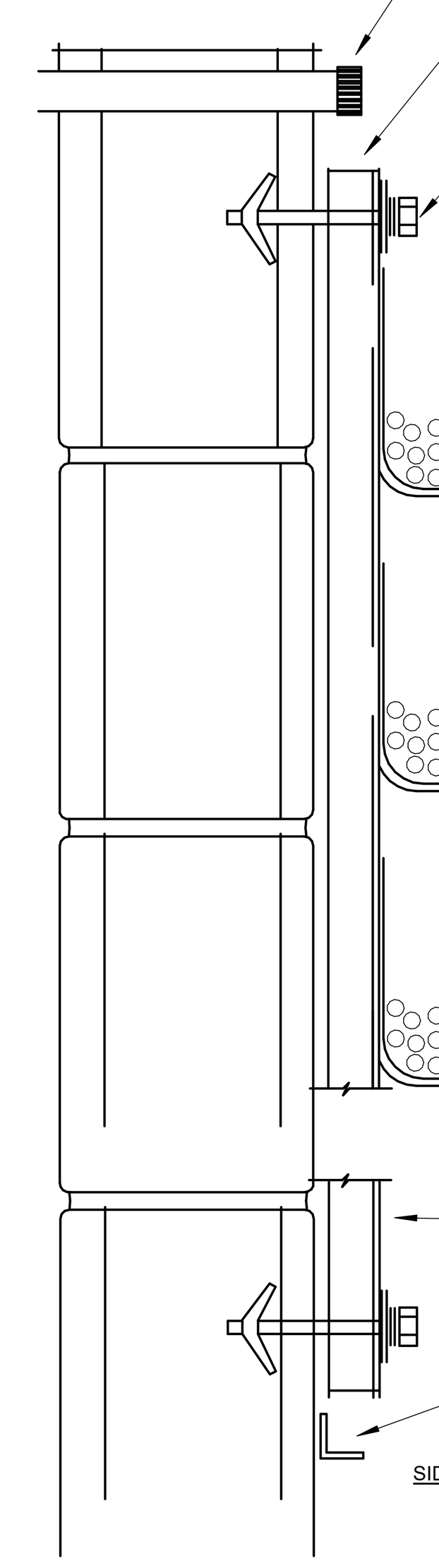
2. ALIGN BACKBOXES OF DEVICES AT THE MOUNTING HEIGHT INDICATED. MEASURE TO THE TOP OF THE BACKBOX FOR STANDARD OUTLET BOXES. NON-STANDARD BACKBOXES ARE TO BE INSTALLED SUCH THAT THE FINISHED DEVICES ARE ALIGNED ALONG THEIR RESPECTIVE CENTERLINES.

3. MOUNTING HEIGHTS SHOWN ILLUSTRATE DESIGN INTENT AND ARE TO BE FOLLOWED UNLESS CONTRADICTED BY APPLICABLE CODE. WHERE DEVICES ARE SHOWN ADJACENT TO DOOR FRAMES ON PLANS INSTALL 12" FROM FRAME TO AVOID SLUSHED SECTIONS OR BRACING. SPECIFIC DEVICES ARE SHOWN IN RELATIVE ORDER FROM DOOR FRAME; WHERE THESE DEVICES ARE NOT PRESENT AT A PARTICULAR LOCATION, ADJUST LOCATIONS CLOSER TO DOOR ACCORDINGLY.

4. THE CONTRACTOR IS TO COORDINATE ALL ROUGH-INS WITH ANY COUNTERTOPS/BACKSPLASHES TO AVOID CONFLICT. ALIGN DEVICE BACKBOXES IN THE BOTTOM OF THE NEXT FULL BLOCK ABOVE THE BACKSPLASH AS SHOWN. FOR NON-BLOCK WALLS ALIGN BOTTOM OF DEVICE BACKBOXES 4" ABOVE BACKSPLASH. COORDINATE WORK WITH CASEWORK AND KITCHEN SHOP DRAWINGS ACCORDINGLY. IF CONFLICT STILL ARISES CONTACT THE ENGINEER FOR DIRECTION ON HOW TO PROCEED.

6 TYPICAL WALL DEVICE MOUNTING DETAIL

NO SCALE



STUB CONDUITS OUT OF ROOM, HOLDING HIGH IN STRUCTURE, TO TERMINATE JUST ABOVE THE J-HOOK ASSEMBLIES WITH AN INSULATED THROAT BUSHING OR FIBRE BUSHING. PULL CABLES DOWN INTO AND THRU J-HOOKS WITHOUT CREATING A STRAIN ON CABLES.

SPACE J-HOOK ASSEMBLIES 48" ON CENTER THROUGHOUT CORRIDORS OF BUILDING, PROVIDING HORIZONTALLY HUNG ASSEMBLIES WHERE CROSSING OVER CORRIDORS OR LARGE OPEN AREAS WITHOUT WALLS TO MOUNT ON. HANG TRAPEZE STYLE WITH COMPLETE ACCESS THRU SUSPENDED CEILINGS AT APPX. 18" ABOVE CEILING. SEE PLANS FOR ROUTINGS.

INSTALL ON CONCRETE BLOCK AND ICF WALLS WITH 3/8" TOGGLE BOLTS OR HILTI ANCHORS. ON DRYWALL WALLS, USE 3/8" TOGGLE BOLTS PLACED THRU METAL STUDS-NOT THRU GYP BOARD. USE CAP SCREWS OR PHILIPS HEAD TOGGLES WITH SQUARE WASHER ON UNISTRUT WITH LOCKWASHER BELOW HEAD.

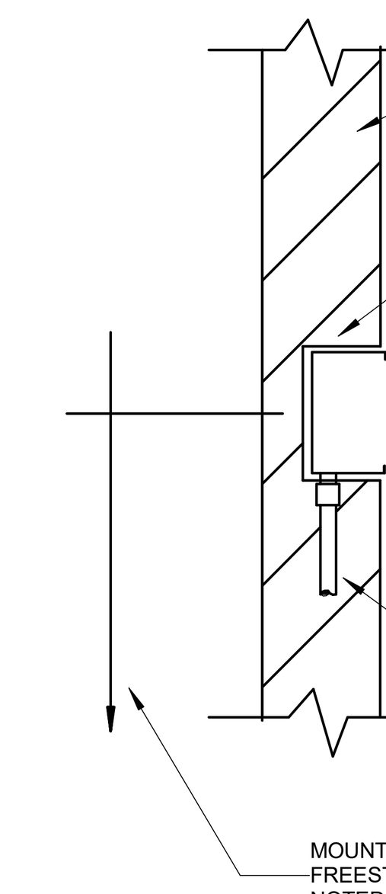
J-HOOKS CABLING PATH SHALL BE THREE TIER (AS INDICATED ON PLANS) WITH 4" HOOKS. B-LINE #BCH64-3S, CADDY, MONO SYSTEMS OR APPROVED EQUAL.

1 &5/8" X 1&5/8" 14Ga UNISTRUT OR EQUIVALENT KINDORF OR ELCEN CHANNEL OF LENGTH SHOWN. LEAVE ROOM AT BOTTOM FOR AN ADDITIONAL J-HOOK TO BE INSTALLED BELOW THE THREE SHOWN (ADD ADDITIONAL ROW IF NECESSARY FOR CAPACITY).

BOTTOM OF WALL MOUNTED ASSEMBLIES TO BE AT APPX. 6" ABOVE FINISHED CEILING HEIGHT-COORDINATE INSTALLATION WITH ALL OTHER TRADES TO ENSURE AT LEAST 18" CLEAR ACCESS ABOVE CEILING TO THE TOP RING.

4 J HOOK INSTALLATION DETAIL

NO SCALE



WALL CONSTRUCTION - SEE ARCHITECTURAL PLANS FOR TYPE.

FLUSH 4" SQ.X 2-1/8" D. J-BOX VERIFY SIZE WITH CONDUCTOR REQUIREMENTS - ENLARGE IF NEEDED.

1 1/2" TO 2" DEEP EXTENSION RING WITHOUT KNOCKOUTS - CUT K.O. AS NEEDED FOR EQUIPMENT FEED OUT OF BOTTOM WITH LIQUIDTIGHT CONNECTOR.

APPLY GASKETING OF SILICONE OR NEOPRENE ALL AROUND FOR MOISTURE RESISTANCE

GASKETED BLANK COVER PLATE OF CAST ALUMINUM OR CORROSION-RESISTANT STEEL.

USE "SEALTITE" TYPE UA LIQUID- TITE CONDUIT TO EQUIPMENT CONNECTION, LEAVING SUFFICENT SLACK FOR EQUIPMENT MOVEMENT AND FREE SERVICE ACCESS. KEEP BOTTOM OF FLEX LOOP 6" OFF FLOOR.

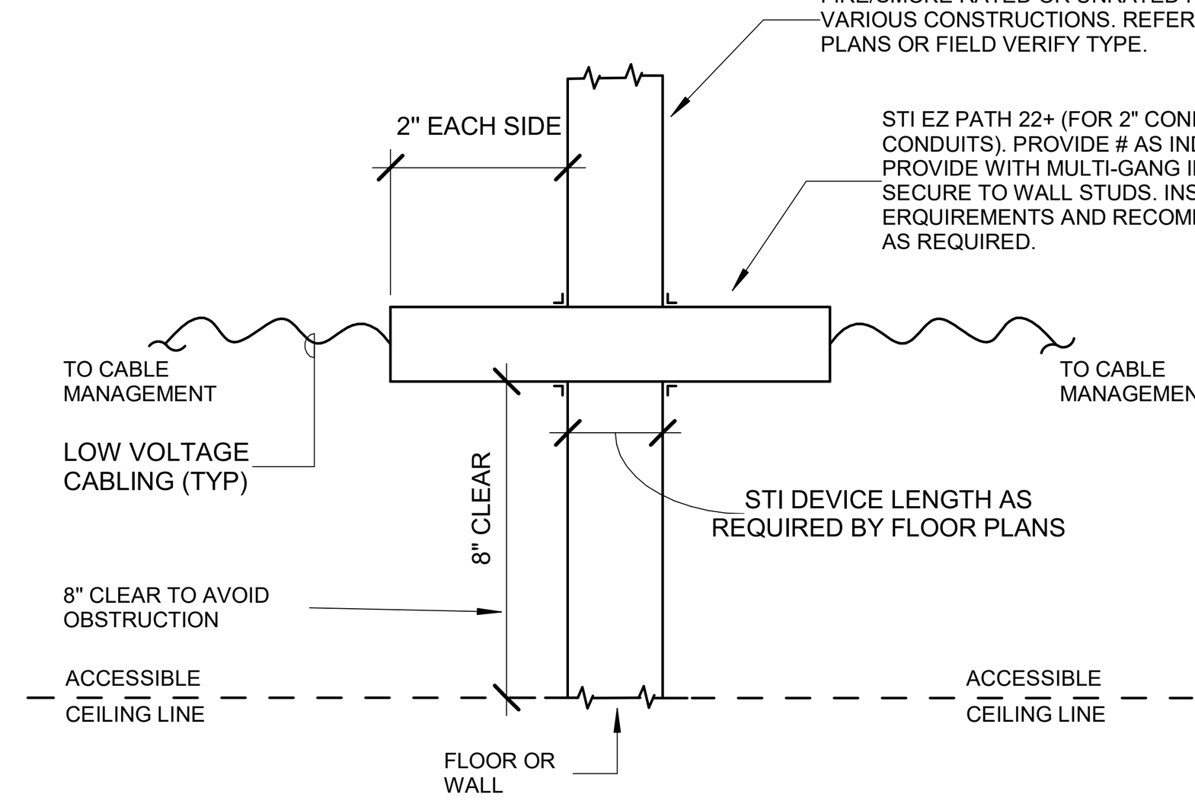
BRANCH CIRCUIT UP OR DOWN - SEE PLAN AND PANELBOARD SCHEDULES

MOUNTING HEIGHT OF BOX TO VARY - USE 36" FOR FREESTANDING EQUIPMENT, UNLESS OTHERWISE NOTED.

SHOWN AS: (J) ON PLANS (TYPICAL)

1 TYPICAL HARD-WIRED CONNECTION

NO SCALE



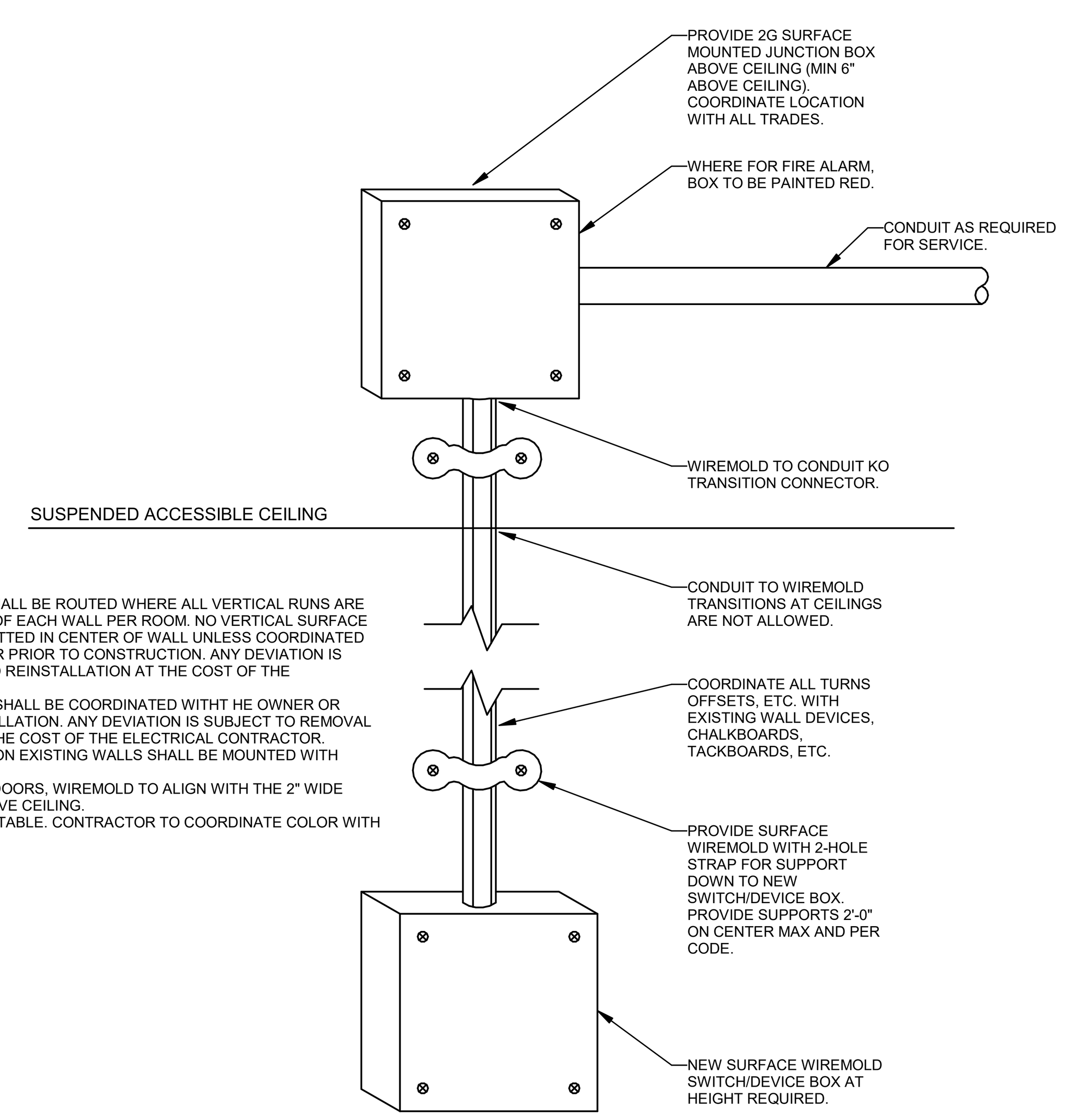
FIRE/SMOKE RATED OR UNRATED PARTITION OF VARIOUS CONSTRUCTIONS. REFER TO ARCHITECTURAL PLANS OR FIELD VERIFY TYPE.

STI EZ PATH 22+ (FOR 2" CONDUITS) AND 44+ (FOR 4" CONDUITS). PROVIDE # AS INDICATED ON FLOOR PLANS. PROVIDE WITH MULTI-GANG INSTALLATION BRACKET AND SECURE TO WALL STUDS. INSTALL PER MANUFACTURERS ERQUIREMENTS AND RECOMMENDATIONS FOR FIRE RATING AS REQUIRED.

NOTE:
PATHWAYS SHALL BE PROVIDED WHERE PENETRATING CEILINGS (RATED OR NOT) FOR EXPOSED CABLE ROUTING TO LADDER TRAY IN MDF/IDF ROOMS. PROVIDE GRID SYSTEMS MOUNT AS REQUIRED.

2 SYSTEMS CABLING SLEEVE INSTALLATION DETAIL

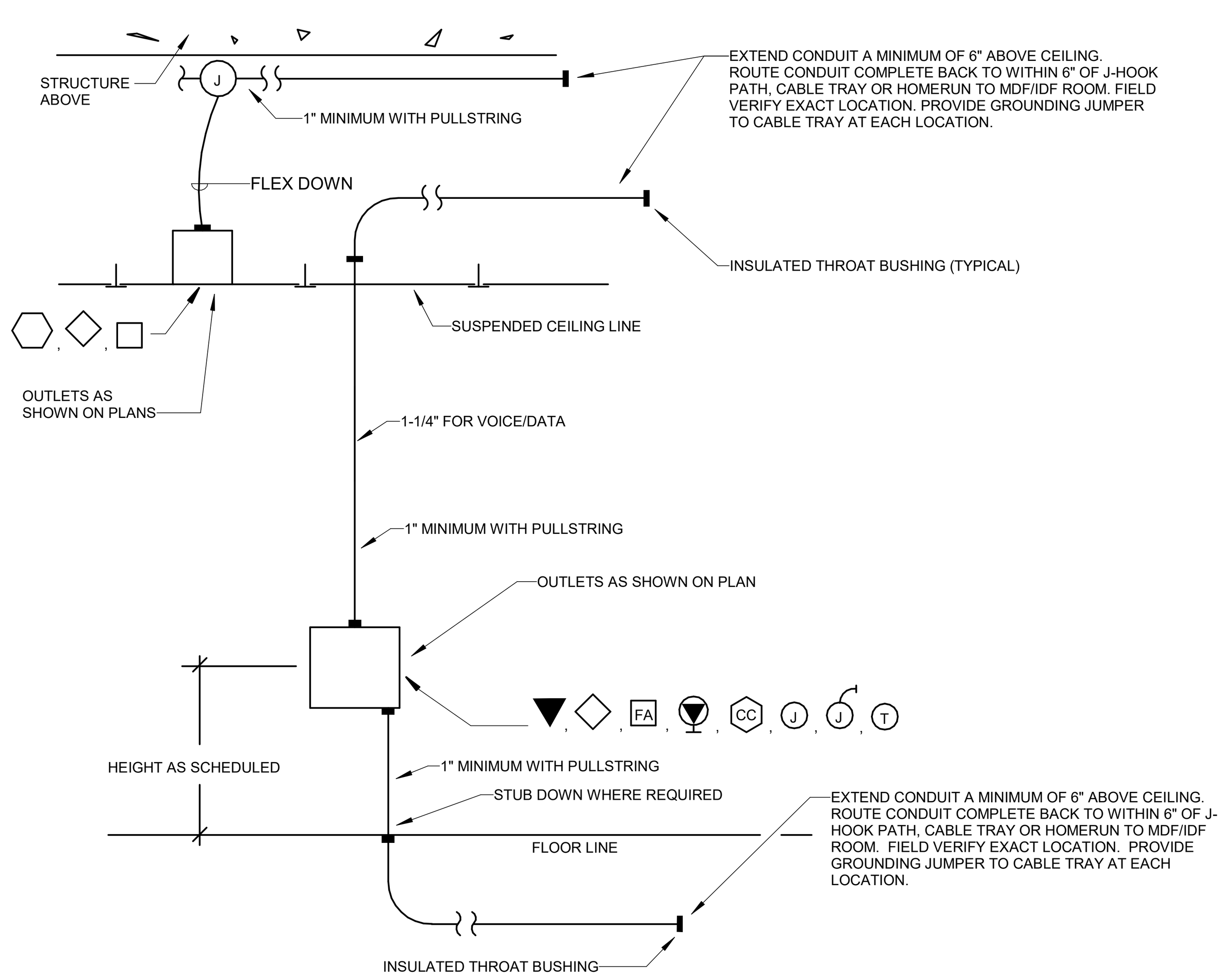
NO SCALE



NOTES:
1. ALL SURFACE WIREWAY SHALL BE ROUTED WHERE ALL VERTICAL RUNS ARE LOCATED IN THE CORNER OF EACH WALL PER ROOM. NO VERTICAL SURFACE WIREWAY SHALL BE PERMITTED IN CENTER OF WALL UNLESS COORDINATED WITH OWNER OR ENGINEER PRIOR TO CONSTRUCTION. ANY DEVIATION IS SUBJECT TO REMOVAL AND REINSTALLATION AT THE COST OF THE ELECTRICAL CONTRACTOR.
2. ALL EXPOSED RACEWAYS SHALL BE COORDINATED WITHT HE OWNER OR ENGINEER PRIOR TO INSTALLATION. ANY DEVIATION IS SUBJECT TO REMOVAL AND REINSTALLATION AT THE COST OF THE ELECTRICAL CONTRACTOR.
3. ALL ELECTRICAL DEVICES ON EXISTING WALLS SHALL BE MOUNTED WITH SURFACE WIREWAYS.
4. AT ACCESS CONTROLLED DOORS, WIREMOLD TO ALIGN WITH THE 2" WIDE MULLION AND EXTEND ABOVE CEILING.
5. ALL WIREMOLD TO BE PAINTABLE. CONTRACTOR TO COORDINATE COLOR WITH ARCHITECT.

7 TYPICAL WIREMOLD DEVICE INSTALLATION

NO SCALE

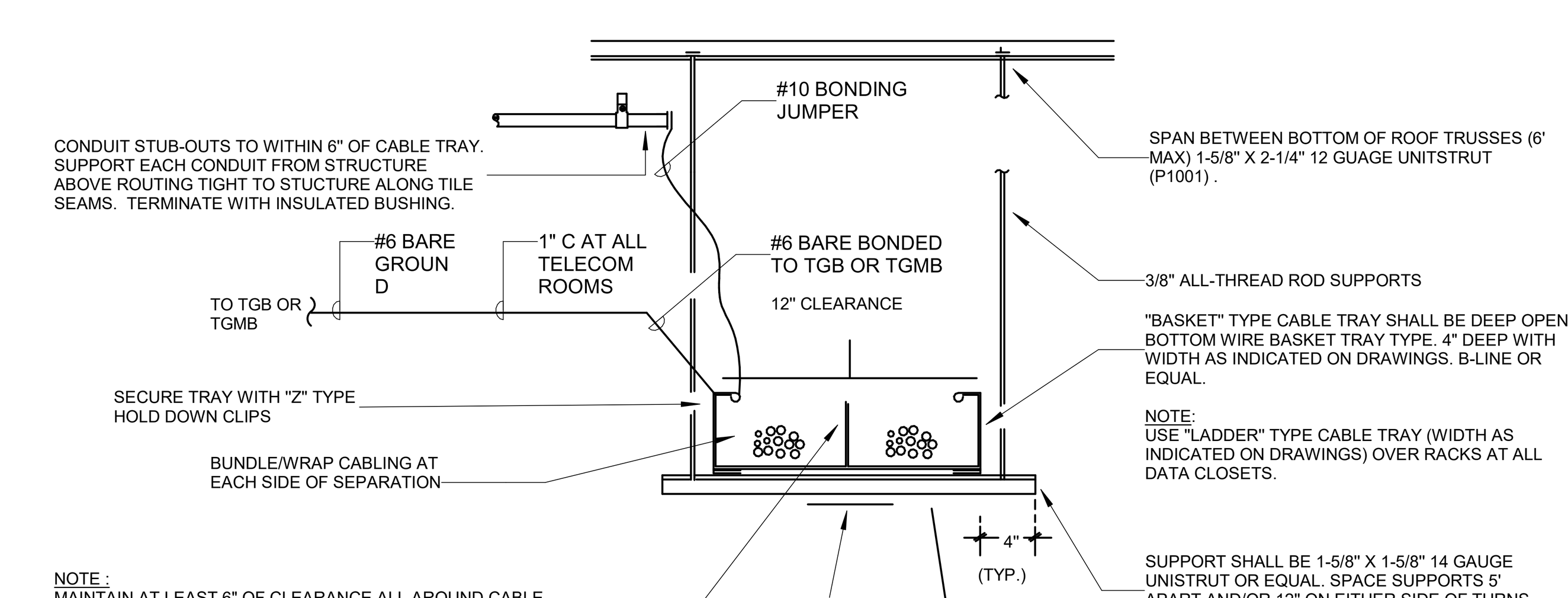


NOTES:

1. EXTEND CONDUIT TO NEAREST WIRING PATH UNLESS CABLING TERMINATES AT ANOTHER OUTLET IN THE SAME ROOM (IN WHICH CASE, STUB CONDUIT OUT ABOVE THE ROOM'S SUSPENDED CEILING). REFER TO GENERAL NOTES LOCATED ON ALL SYSTEM'S DRAWINGS. ACCESS CONTROL CONDUITS SHALL STUB ABOVE ACCESSIBLE CEILING FOR VENDOR FURNISHED ACCESS CONTROL CABLING, ETC.
2. WHERE OPEN CABLING IS INSTALLED WITHIN ENVIRONMENT AIR PLENUMS, SUCH CABLING SHALL MEET NEC REQUIREMENTS FOR SUCH INSTALLATIONS.
3. LABEL BACK OF OUTLET BOXES AND ENDS OF CONDUIT WITH UNIQUE NUMBER TO IDENTIFY EACH STUB-UP. USE PERMANENT MARKER PEN, 3/4" HIGH LETTERS. MATCH NUMBER ON OUTLET BOX TO END OF CONDUIT
4. INSTALL TELECOMMUNICATION AND CABLE TV OUTLETS WITHIN 6" OF POWER RECEPTACLE WHERE POWER RECEPTACLE IS SHOWN ON POWER PLANS IN SAME GENERAL LOCATION.

5 ROUGHING-IN DETAIL FOR STUB-OUTS

NO SCALE



CONDUIT STUB-OUTS TO WITHIN 6" OF CABLE TRAY. SUPPORT EACH CONDUIT FROM STRUCTURE ABOVE ROUTING TIGHT TO STUCTURE ALONG TILE SEAMS. TERMINATE WITH INSULATED BUSHING.

SECURE TRAY WITH "Z" TYPE HOLD DOWN CLIPS

BUNDLE/WRAP CABLING AT EACH SIDE OF SEPARATION

SPAN BETWEEN BOTTOM OF ROOF TRUSSES (6' MAX) 1-5/8" X 2-1/4" 12 GUAGE UNITSTRUT (P1001) .

3/8" ALL-THREAD ROD SUPPORTS

"BASKET" TYPE CABLE TRAY SHALL BE DEEP OPEN BOTTOM WIRE BASKET TRAY TYPE. 4" DEEP WITH WIDTH AS INDICATED ON DRAWINGS. B-LINE OR EQUAL.

NOTE:
USE "LADDER" TYPE CABLE TRAY (WIDTH AS INDICATED ON DRAWINGS) OVER RACKS AT ALL DATA CLOSETS.

SUPPORT SHALL BE 1-5/8" X 1-5/8" 14 GAUGE UNISTRUT OR EQUAL. SPACE SUPPORTS 5' APART AND/OR 12" ON EITHER SIDE OF TURNS, TEES OR ENDS.

10'-0" A.F.F. OR AS REQUIRED ABOVE ACCESSIBLE CEILING

COORDINATE EXACT ROUTING WITH ALL OTHER TRADES AND OFFSET AS REQUIRED AS REQUIRED

NOTE :
MAINTAIN AT LEAST 6" OF CLEARANCE ALL AROUND CABLE TROUGH AT COMPLETION OF ALL INSTALLATIONS TO ALLOW FULL ACCESS TO PULL WIRING. PROVIDE ANY NEEDED OFFSETS AROUND PIPING, DUCTS, ETC. BY COORDINATING WITH OTHER TRADES IN THE FIELD PRIOR TO BEGINNING ROUGH-INS. MINIMIZE THE NUMBER OF OFFSETS REQUIRED BY CAREFUL COORDINATION.

PROVIDE WITH 4" TALL IN-LINE DIVIDER TO DIVIDE SHARED TRAY BETWEEN DATA-VOICE CABLES AND ALL OTHER CABLES.

3 CABLE TRAY INSTALLAITON DETAIL

NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG #23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ELECTRICAL DETAILS

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

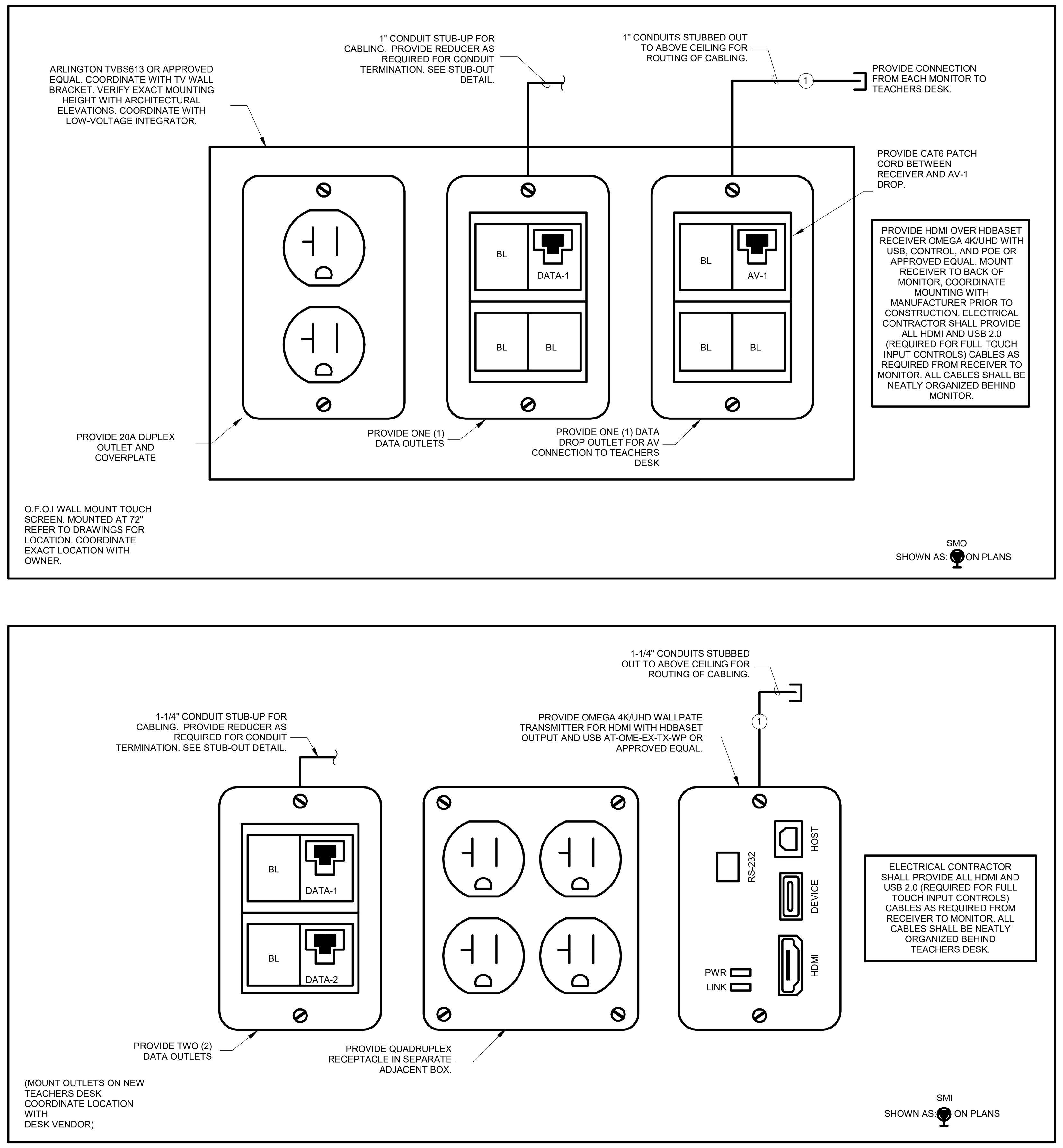
REVISIONS

No.	Description	Date

SHEET

E5.2

1506.2
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/2/2023 9:28:17 AM



4 TEACHING MONITOR INSTALLATION DETAIL

NO SCALE

C.F.C.I. CONDUCTORS AND CONNECTORS:

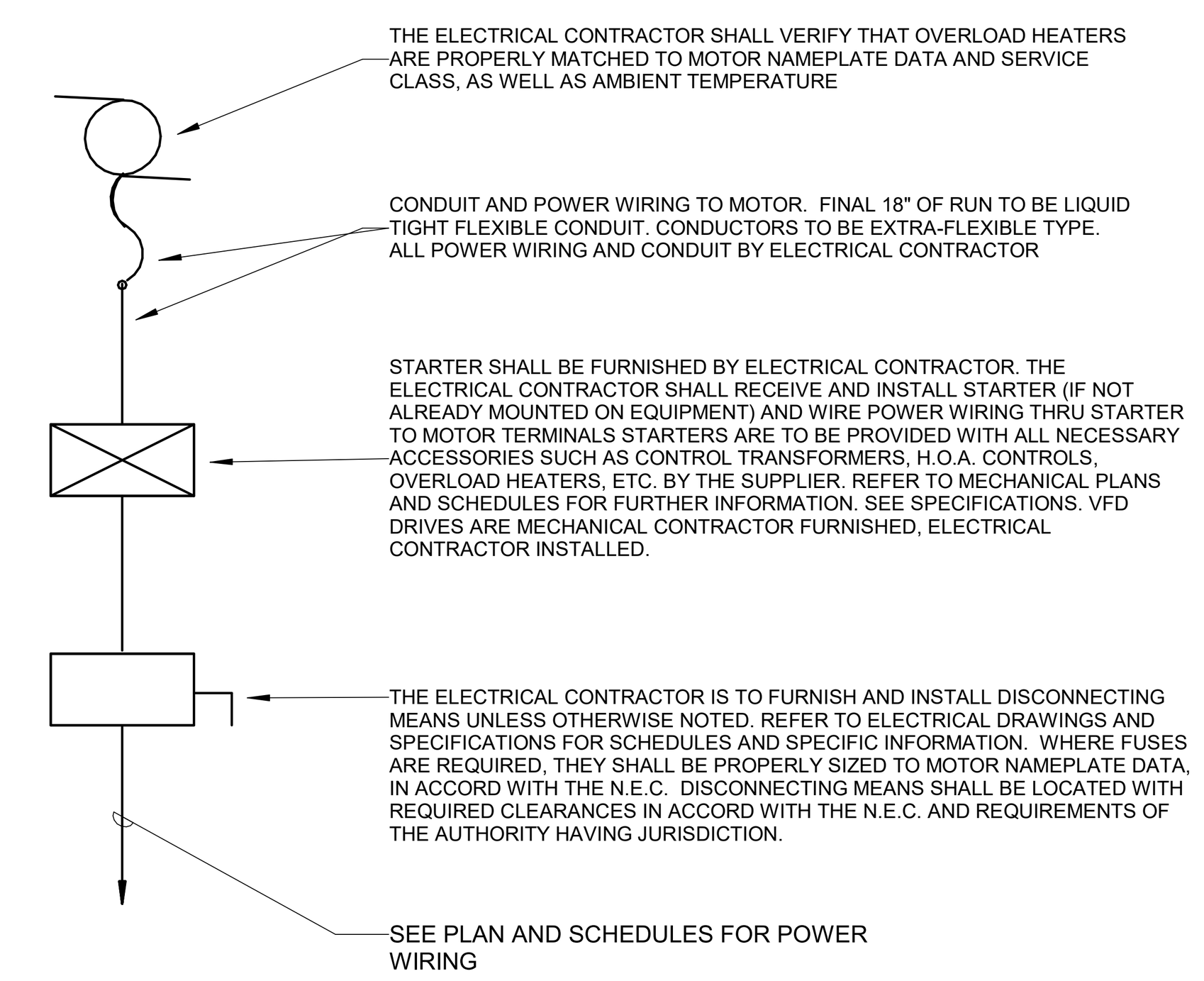
RUN#	DESCRIPTION
1	CAT6 CABLE PER DATA VOICE SYSTEM SPECS - LENGTH AS REQUIRED.

PROVIDE BRIDAL RINGS ON MIN. 4'-0 CENTERS FOR CABLE SUPPORT.

EXACT MOUNTING HEIGHTS OF ALL EQUIPMENT AND ASSOCIATED ROUGH-INS ARE TO BE COORDINATE WITH OWNER/ENGINEER PRIOR TO ROUGH-IN.

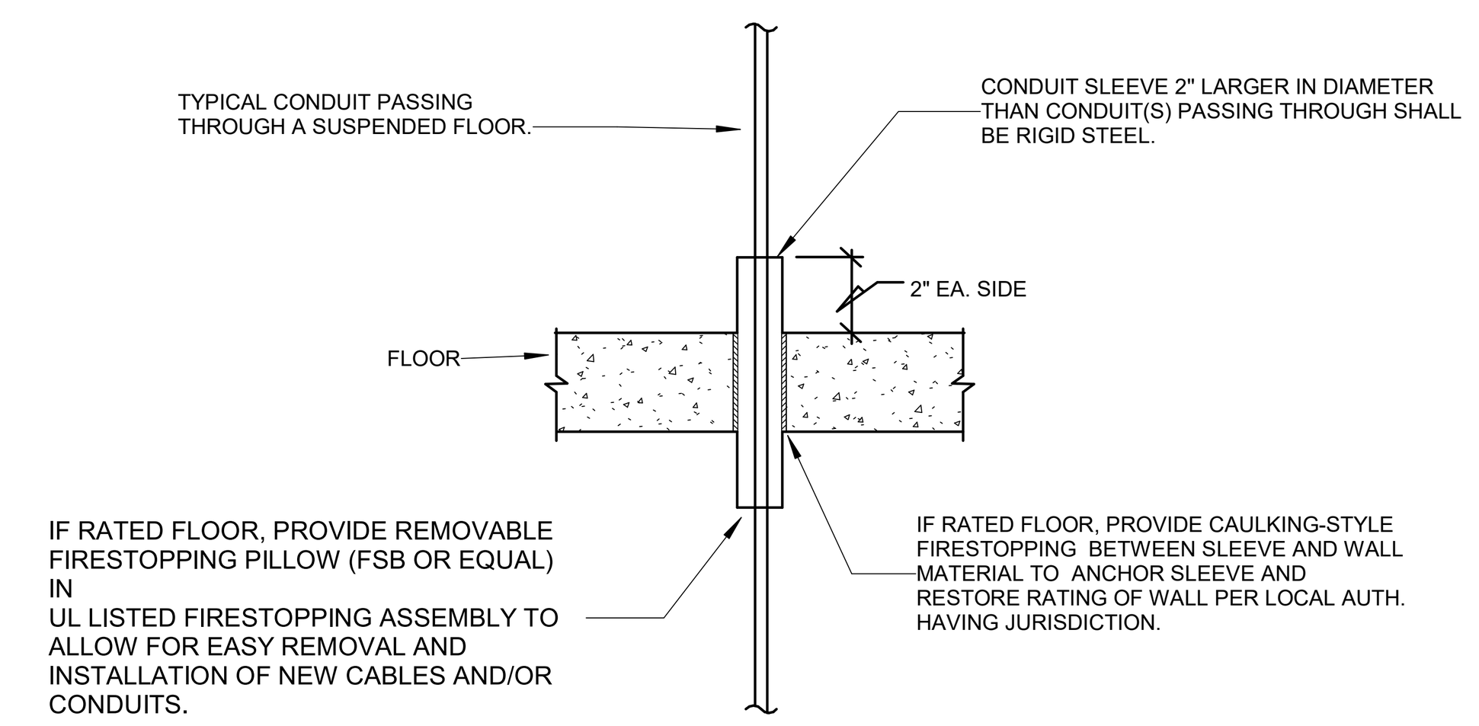
CONTRACTOR SHALL REFER TO ALL MANUFACTURERS INSTALLATION INSTRUCTIONS

THE CONTRACTOR SHALL PROVIDE A MINIMUM OF FOUR HOURS OF INSTRUCTIONAL TIME TO THE OWNER IN THE OPERATION AND MAINTENANCE OF ALL EQUIPMENT AND COMPONENTS. A RECEIPT SHALL BE OBTAINED FROM THE OWNER THAT THIS HAS BEEN ACCOMPLISHED, AND A COPY FORWARDED TO THE ENGINEER. THE CONTRACTOR WILL BE REQUIRED TO VIDEO THE IN-SERVICE TRAINING AND PROVIDE THIS VIDEO IN DIGITAL FORMAT TO THE OWNER AS PART OF THE CLOSE OUT DOCUMENTATION.



1 DETAIL OF TYPICAL MOTOR/STARTER INSTALLATION

NO SCALE

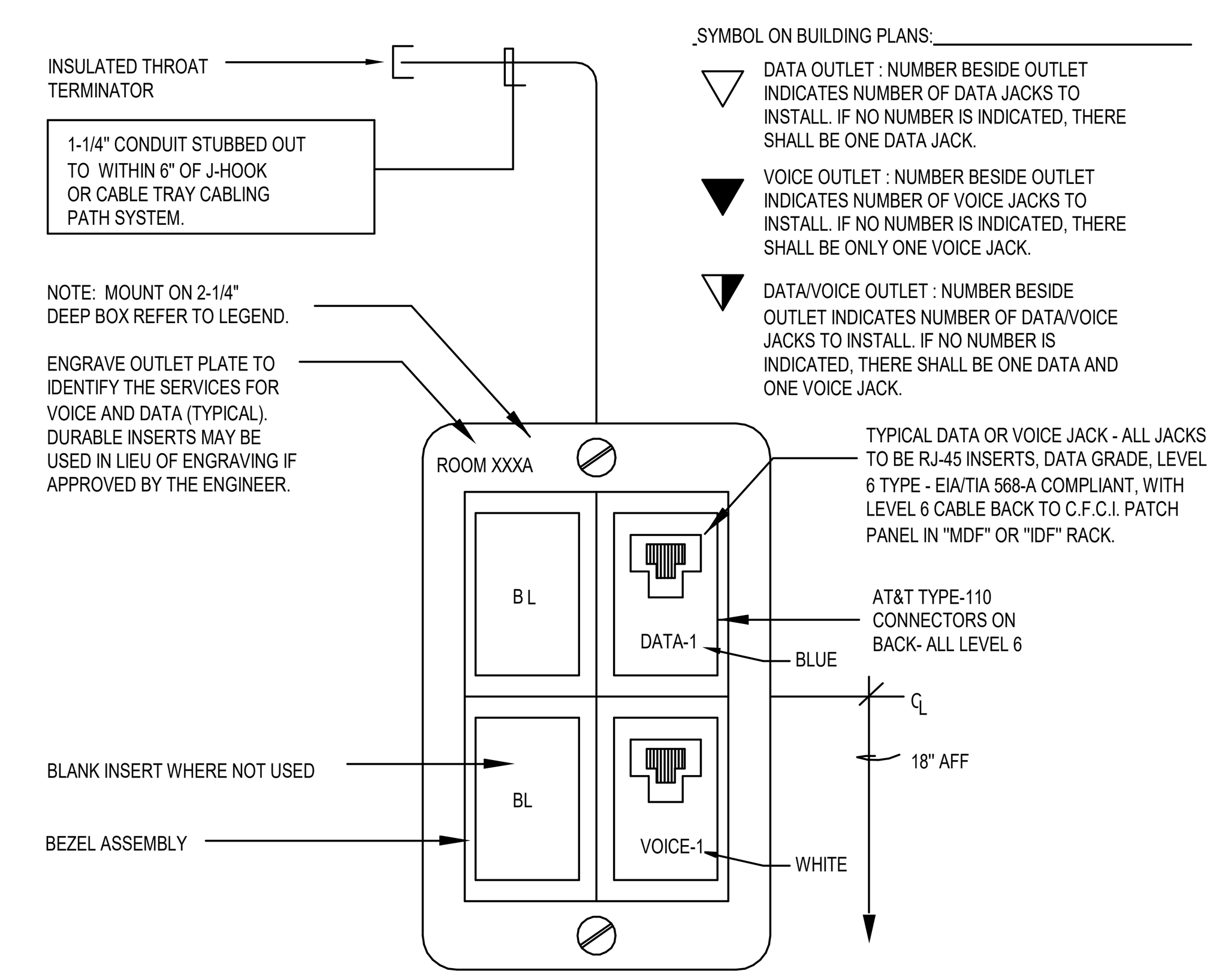


GENERAL FLOOR PENETRATION NOTES :

- WHERE CONDUITS PENETRATE A FLOOR SLAB AND ARE EXPOSED, PROVIDE SQUARE 4" HIGH CONCRETEPAD AROUND CONDUIT SLEEVE AND EXTEND SLEEVE 4" ABOVE PAD.
- WHERE CONDUITS OR SLEEVES PENETRATE FLOORS IN GROUPS, THE CONCRETE PAD SHOULD BE CONTINUOUS AROUND ALL CONDUITS OR SLEEVES.

2 CONDUIT PENETRATION SLEEVE INSTALLATION

NO SCALE



3 DATA/VOICE OUTLET BOX DETAIL

NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY BRIAN K. BAUMGARTLE 23119 LICENSED PROFESSIONAL ENGINEER

CMTA A LEGENCE Company
10411 Meeting Street | Louisville, KY 40059 | 502.326.3085 | cmta.com

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ELECTRICAL DETAILS

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

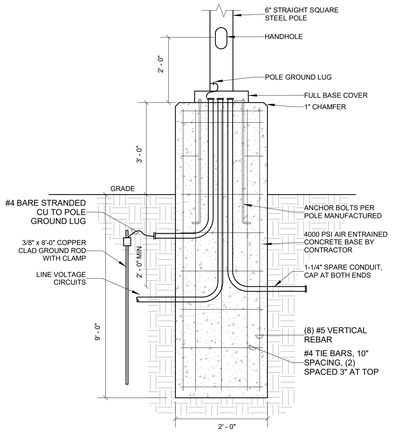
REVISIONS

No.	Description	Date

SHEET

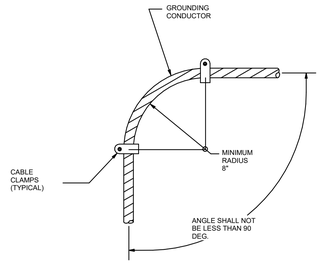
E5.3

1506.2
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/2/2023 9:26:18 AM



5 POLE BASE DETAIL

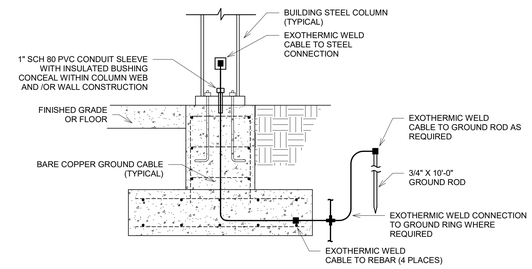
NO SCALE



3 CONDUCTOR BEND RADIUS DETAIL

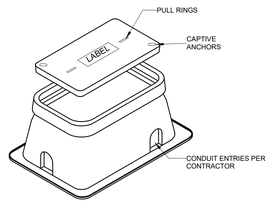
NO SCALE

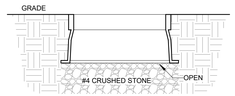
1. WHERE FOOTING REBAR DOES NOT MEET REQUIREMENTS OF NEC 250.52(A)(3), PROVIDE 20FT OF #4 AWG BARE COPPER CONDUCTOR.
2. PROVIDE PVC SLEEVE WHERE CONDUCTORS ARE EXPOSED TO PHYSICAL DAMAGE. SEAL CONDUIT OPENINGS.
3. LOCATE EXTERIOR ELECTRODES A MINIMUM OF 5FT OUTSIDE THE BUILDING DRIP LINE.



1 CONCRETE FOOTING GROUNDING DETAIL

NO SCALE



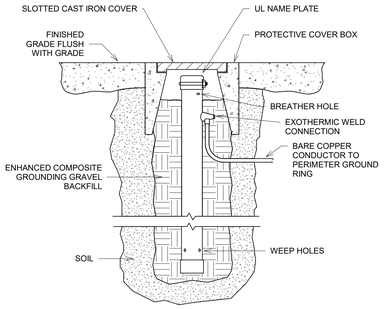


NOTES:
1. BOXES TO BE SIZED PER NEC 314.28 BASED UPON FIELD CONFIGURATION OF CONDUIT ENTRIES. PROVIDE EXTENSIONS WHERE REQUIRED.
2. BOX AND LID TO BE CONSTRUCTED OF POLYMER CONCRETE. LID TIER RATING PER INSTALLED LOCATION.
3. REFER TO SPECIFICATIONS FOR RELATED INFORMATION.

6 PULL BOX DETAIL

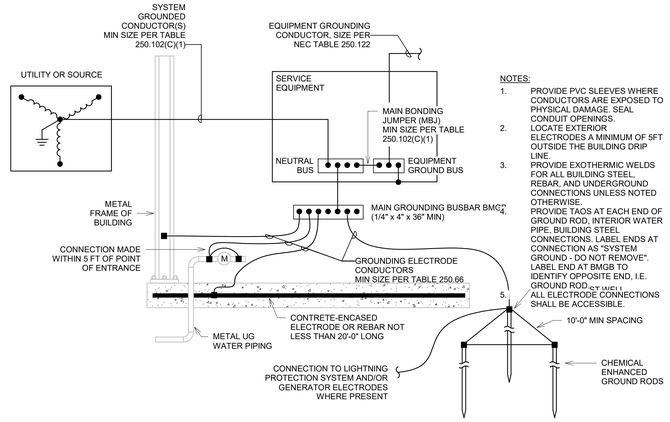
NO SCALE

NOTES:
- SYSTEM SHALL NOT REQUIRE MAINTENANCE THOUGHOUT THE LIFE OF THE ELECTRODE.
- BASIS OF DESIGN: LYNCOLE XIT ELECTROLYTIC GROUND ROD



4 CHEMICAL ENHANCED GROUND ROD

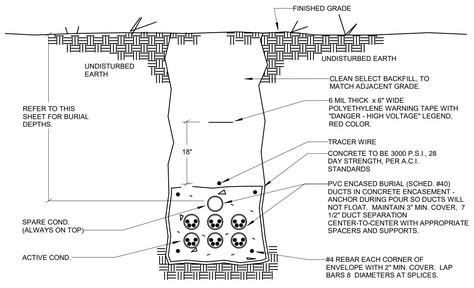
NO SCALE



NOTES:
1. PROVIDE PVC SLEEVES WHERE CONDUCTORS ARE EXPOSED TO PHYSICAL DAMAGE. SEAL CONDUIT OPENINGS.
2. LOCATE EXTERIOR ELECTRODES A MINIMUM OF 5FT OUTSIDE THE BUILDING DRIP LINE.
3. PROVIDE EXOTHERMIC WELDS FOR ALL BUILDING STEEL, REBAR, AND UNDERGROUND CONNECTIONS UNLESS NOTED OTHERWISE.
4. PROVIDE TAOS AT EACH END OF GROUND ROD, INTERIOR WATER PIPE, BUILDING STEEL CONNECTIONS. LABEL ENDS AT CONNECTION AS "SYSTEM GROUND - DO NOT REMOVE". LABEL END AT BMGB TO IDENTIFY OPPOSITE END, I.E. GROUND ROD - DO NOT REMOVE
5. ALL ELECTRODE CONNECTIONS SHALL BE ACCESSIBLE.

2 GROUNDING ELECTRODE SYSTEM DETAIL

NO SCALE



GENERAL NOTES:

A. USE SWEEPING BENDS AT ALL TURNS AND RIGID STEEL ELLS.
B. COMMUNICATIONS RACEWAYS SHALL BE RUN IN DUCT BANK ENCASED CONSTRUCTION, CONSTRUCTED SAME AS SHOWN, EXCEPT FOR NUMBER AND SIZE OF CONDUIT.
C. POUR CONCRETE AGAINST UNDISTURBED EARTH.
D. REFER TO SPECIFICATION SECTION 260040 FOR EXCAVATION, TRENCHING, BACKFILLING AND GRADING REQUIREMENTS. REFER TO EARTHWORK SPECIFICATIONS FOR GENERAL ROCK REMOVAL AND EARTHWORK REQUIREMENTS.

7 TYPICAL DUCT BANK CONSTRUCTION DETAIL

NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

STATE OF KENTUCKY — BRIAN K. BARNHART — 22185 — LICENSED PROFESSIONAL ENGINEER

CMTA — A LEGENCE Company — 1001 Sterling Drive | Lexington, Kentucky 40511 | cmtaeng.com

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
BG #24.277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ELECTRICAL DETAILS

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

REVISIONS

No.	Description	Date

SHEET

E5.4

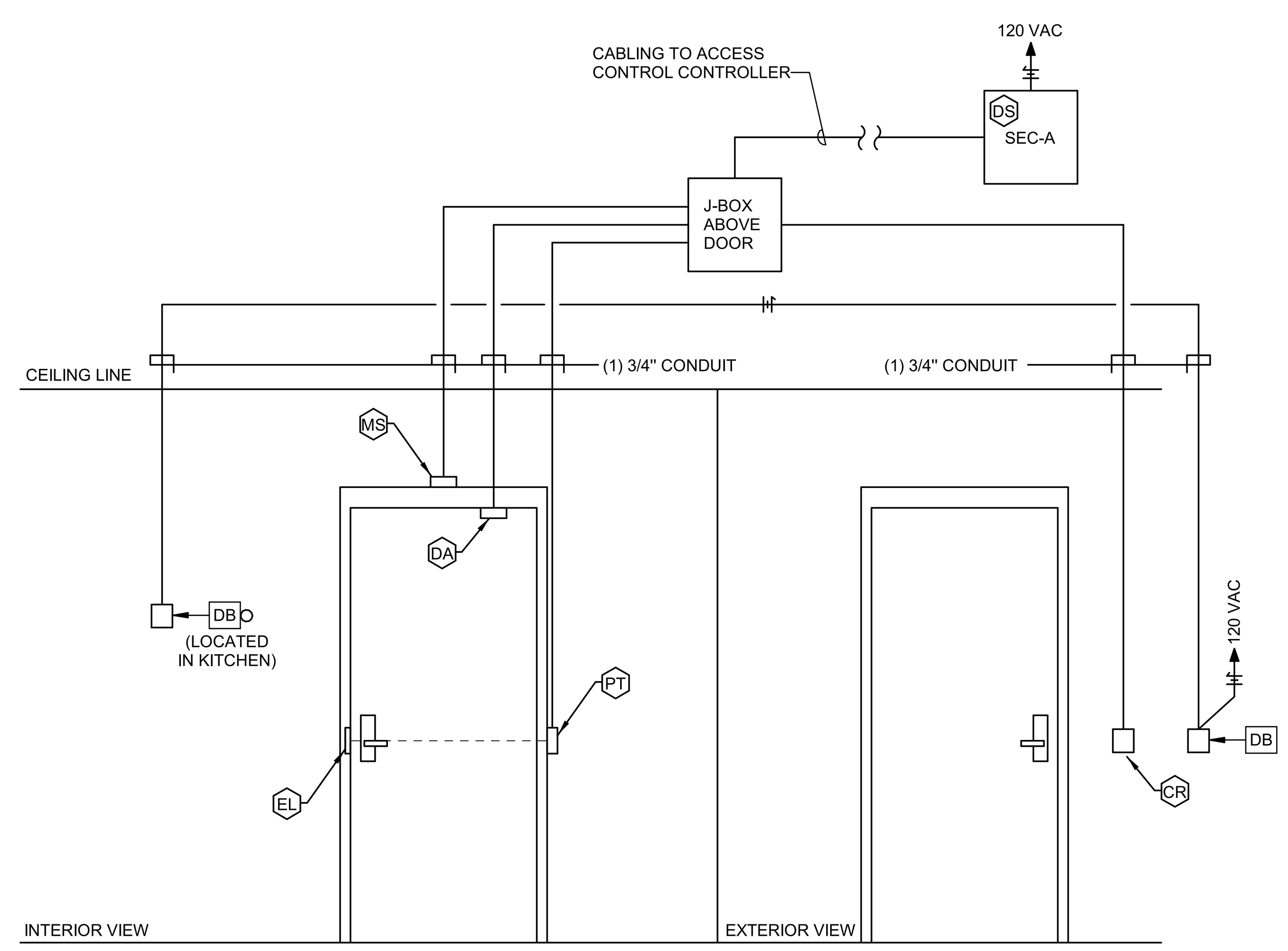
ITEM	DESCRIPTION	WIRING
DA	CONCEALED DOOR ALARM CONTACT (POSITION) SWITCH, ROUND, POP-IN, BALANCED	COMPOSITE, PLENUM RATED CABLE
EL	ELECTRIFIED LATCH	COMPOSITE, PLENUM RATED CABLE
SA	PIEZO DOOR HOLD OPEN SOUNDER ALARM	COMPOSITE, PLENUM RATED CABLE
CR	CARD READER / KEY FOB	COMPOSITE, PLENUM RATED CABLE
ES	ELECTRIC DOOR STRIKE	COMPOSITE, PLENUM RATED CABLE
MS	REQUEST TO EXIT MOTION SENSER DOOR CONTROL WITH SOUNDER (BOSCH DX160)	COMPOSITE, PLENUM RATED CABLE
PB	PUSH BUTTON STATION MOUNTED UNDER DESK, MOMENTARY PUSH BUTTON	COMPOSITE, PLENUM RATED CABLE
DR	DOOR RELEASE BUTTON	COMPOSITE, PLENUM RATED CABLE
PP	PUSH PLATE	COMPOSITE, PLENUM RATED CABLE
PT	POWER TRANSFER (FRAME TO DOOR)	COMPOSITE, PLENUM RATED CABLE
IM	AUDIO/VIDEO INTERCOM MASTER STATION (AXIS)	
AI	AUDIO/VIDEO INTERCOM REMOTE STATION (AXIS)	18/4 CABLE TO DOOR ACCESS PANEL
DB	DOORBELL AUDIO/VISUAL STATION	(2) #12 AWG, (1) #12 AWG GND
DB	DOORBELL PUSHBUTTON STATION	(2) #12 AWG, (1) #12 AWG GND
DS	DOOR POWER SUPPLY (LOCATE IN MDF / IDF)	(2) #12 AWG, (1) #12 AWG GND
SB	SWATBOX WITH CARD READER	COMPOSITE, PLENUM RATED CABLE
SEC-A	ACCESS DOOR CONTROLLER (LOCATE IN MDF/IDF. SEE FLOOR PLANS FOR LOCATIONS)	(2) #12 AWG, (1) #12 AWG GND

ACCESS CONTROL AND INTRUSION SYSTEM NOTES:

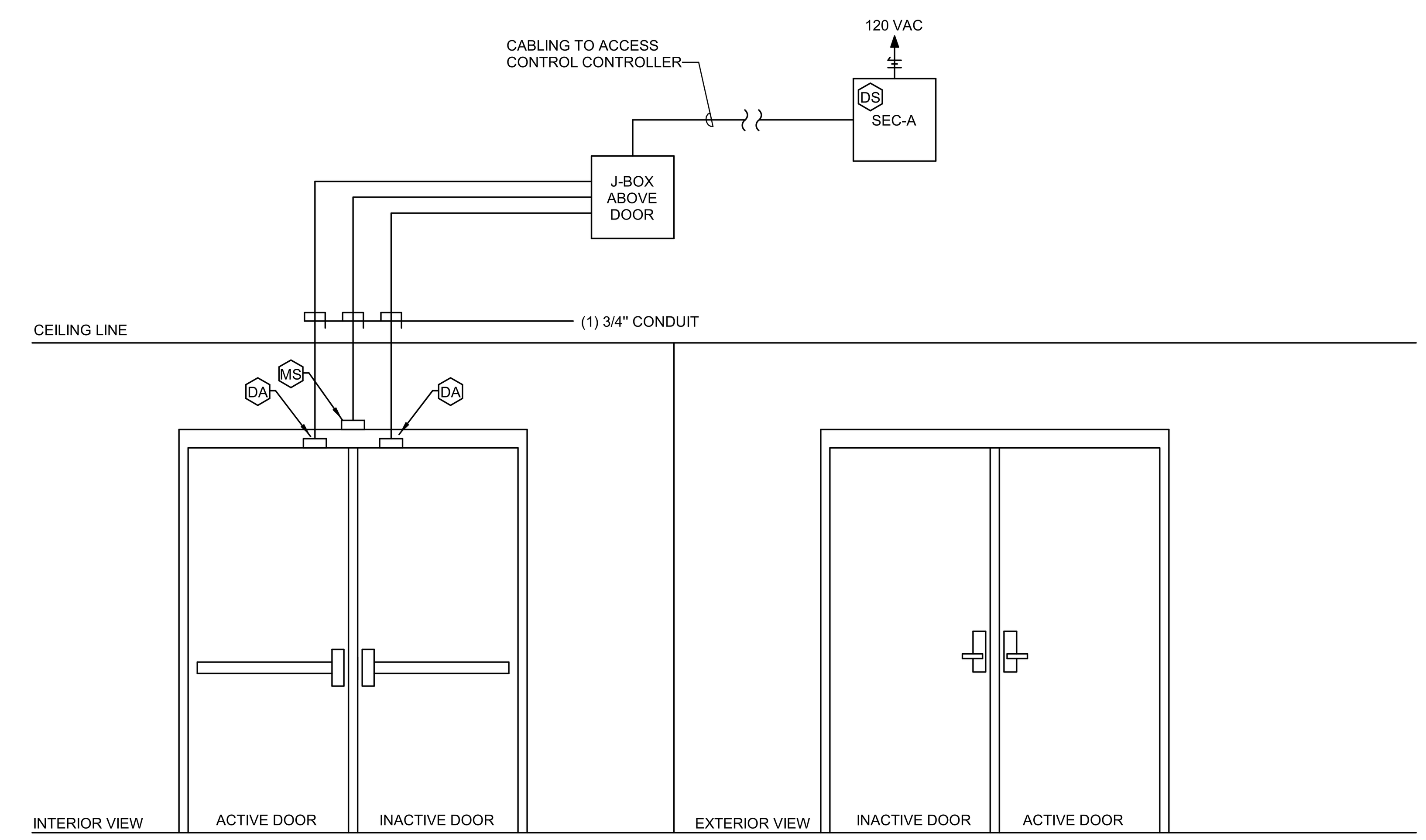
1. INSTALLATION MUST BE COORDINATED WITH THE OWNER, ARCHITECT, ELECTRICAL CONTRACTOR AND DOOR HARDWARE CONTRACTOR PRIOR TO ROUGH-IN AND INSTALLATION.
2. INSTALLATION MUST BE COORDINATED WITH ANY DOOR OPERATOR EQUIPMENT.
3. ALL REQUIRED MODIFICATIONS TO THE DOOR FRAMES SHALL BE THE RESPONSIBILITY OF THE DIVISION 28 CONTRACTOR.
4. EGRESS SHALL NOT BE IMPEDED BY ACCESS CONTROLS AND SHALL BE ACCOMPLISHED BY THE DOOR HARDWARE.
5. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL POWER CIRCUITS AND RECEPTACLES FOR THE SYSTEM.
6. DOOR HARDWARE SHALL BE PROVIDED AND INCTALLED AS PART OF THE DOOR HARDWARE CONTRACT.
7. THE ASSOCIATED LINE DIAGRAMS PRESENTS A TYPICAL SYSTEM WIRING SCHEME. NOT ALL CONNECTIONS ARE SHOWN.
8. ELECTRICAL CIRCUITS FEEDING THE ACCESS CONTROL SYSTEM SHALL BE DEDICATED TO THE SECURITY SYSTEM AND HAVE CIRCUIT BREAKER LOCK OFF CAPABILITY.
9. ALL CABLING SHALL BE PLENUM RATED AND ALL WIRING SHALL BE PER MANUFACTURER'S RECOMMENDATIONS.
10. DOOR CONTACTS SHALL BE RECESSED UNLESS OTHERWISE NOTED.
11. CARD READER PATHWAYS SHALL BE RECESSED AND FLUSH MOUNTED IN ALL INSTANCES.
12. SUBMITTALS AND SHOP DRAWINGS SHALL INCLUDE EXACT PRODUCT DATA CLEARLY INDICATED, SYSTEM CONNECTIONS, WIRING DIAGRAMS AND DEVICE LOCATIONS.
13. AS-BUILT DOCUMENTATION SHALL BE SUBMITTED IN ELECTRONIC AUTOCAD AND HARDCOPY FORMAT AND SHALL INCLUDE ALL SYSTEM REVISIONS.

DOOR HARDWARE RISERS (GENERAL NOTES)

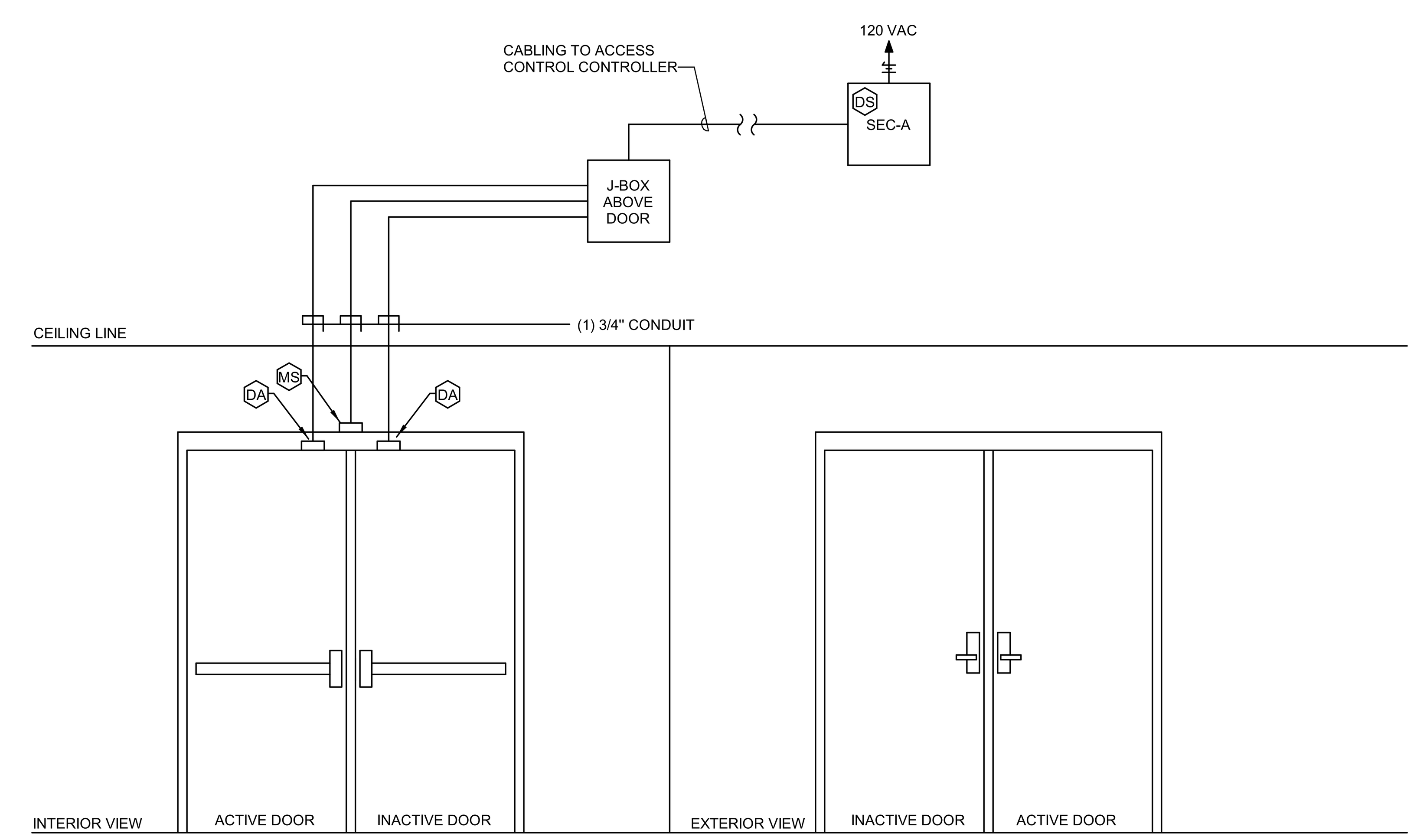
A. REFER TO SPECIFICATION 087100, FINISHED HARDWARE, FOR ADDITIONAL REQUIREMENTS.
B. PROVIDE ALL NECESSARY ROUGH-INS, 120V POWER, AND CONNECTIONS AS REQUIRED FOR A COMPLETE AND FULLY-FUNCTIONING DOOR HARDWARE ACCESS CONTROL SYSTEM.
C. COORDINATE ALL REQUIRED FIRE ALARM CONNECTIONS WITH DOOR HARDWARE SPECIFICATIONS AND VENDOR. SEE FLOOR PLANS AND SPECIFICATIONS FOR LOCATIONS AND REQUIREMENTS.
D. COORDINATE ALL REQUIREMENTS WITH FINAL DOOR HARDWARE SPECIFICATIONS PRIOR TO ROUGH-IN.



3 DOOR E167 HARDWARE DETAIL
NO SCALE REF: E4.1



1 DOOR E167a HARDWARE DETAIL
NO SCALE REF: E3.1



2 DOOR E164b HARDWARE DETAIL
NO SCALE REF: E3.1

SHERMAN CARTER BARNHART ARCHITECTS

CMTA
A LEGENCE Company

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
BG #23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

DOOR DETAILS

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

REVISIONS

No.	Description	Date

SHEET
E5.5

GENERAL NOTES (LUMINAIRE SCHEDULE):

A. ALL LUMINAIRES AND COMPONENTS SHALL BE UL LISTED.

B. WHERE LUMINAIRES ARE SHOWN SPLIT-WIRED (HALF EMERGENCY POWER/ HALF NORMAL POWER) ON FLOOR PLANS, LUMINAIRES SHALL BE PROVIDED WITH MULTIPLE ELECTRONIC BALLASTS FOR MULTIPLE POWER CIRCUITS AS INDICATED ON FLOOR PLANS.

C. PROVIDE DRIVERS FOR FIXTURE LAMP SWITCHING AS INDICATED ON LIGHTING FLOOR PLANS.

D. CONTRACTOR SHALL FOCUS, AIM AND ADJUST LUMINAIRES UNDER THE SUPERVISION AND DIRECTION OF THE ENGINEER AND ARCHITECT. ALLOW LABOR FOR FINAL FOCUS AND ADJUSTMENTS AFTER DARK. LIFTS AND SCAFFOLDING SHALL BE AVAILABLE.

E. ALL LAY-IN FIXTURES SHALL BE PROVIDED WITH SCREW ON HOLD DOWN CLIPS AND MAXIMUM 6'-0" LONG FLEXIBLE CONDUIT WHIPS.

F. ALL FIXTURES SHALL HAVE A CRI GREATER THAN 80, U.O.N.

G. CONFRIRM ALL FINISHES AND MOUNTING HEIGHTS WITH ARCHITECT DURING SHOP DRAWING REVIEW. PROVIDE CUSTOM, FACTORY CUT STEM LENGTHS AS REQUIRED.

H. REFER TO LIFE SAFETY AND LIGHTING DRAWINGS FOR MOUNTING REQUIREMENTS, NUMBER OF FACES AND ARROWS (CHEVRONS) FOR ALL EXIT SIGNS, COORDINATE WITH ARCHITECT'S REFLECTED CEILING PLANS.

I. CONTRACTOR SHALL VERIFY CEILING TYPES PRIOR TO ORDERING FIXTURE AND PROVIDE FIXTURES APPROPRIATE TO THE ACTUAL CONDITION. THIS IS TO INCLUDE SPECIFIC TYPE OF LAY-IN CEILING GRID.

J. ALL LUMINAIRES, INCLUDING PENANTS AND DOWNLIGHTS SHALL HAVE A "MAXIMUM WATTAGE LABEL" AFFIXED TO EACH FIXTURE BY THE MANUFACTURER'S FACTORY. MAXIMUM WATTAGE TO BE BASED ON THE SPECIFIED LIGHT ENGINE AND/OR DRIVER FROM THE LIGHT FIXTURE SCHEDULE.

K. ALL LUMINAIRES SHALL HAVE INTERNAL FAST-BLOWING FUSING.

L. PROVIDE GROUNDING CONDUCTOR AND NEUTRAL TO ALL SWITCHES, DIMMERS, AND WALL MOUNTED OCCUPANCY SENSORS.

M. FIXTURES AND ASSOCIATED ON-BOARD CIRCUITRY MUST MEET CLASS A EMISSION LIMITS REFERRED TO IN FEDERAL COMMUNICATIONS COMMISSION (FCC) TITLE 47, SUBPART B, SECTION 15 NON-CONSUMER REQUIREMENTS FOR EMI/RFI EMISSIONS. ANY ADDITIONAL MATERIALS AND LABOR REQUIRED TO ADDRESS EMI/RFI ISSUES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

N. ALL DOWNLIGHTS ABOVE SHOWER AREAS SHALL HAVE DEAD FRONT DROP LENS TRIM.

ELEC - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	BASIS OF DESIGN		EQUAL MANUFACTURERS	MOUNTING	LAMPS / CCT	MINIMUM LUMENS	MAXIMUM WATTAGE	VOLTAGE	REMARKS
		MANUFACTURER	MODEL							
A1	2'X4" LAY-IN LED TROFFER WITH 22-GUAGE POWDER STEEL AND AMATTE WHITE POWDER PAINT FOR IMPROVED AESTHETICS.	LITHONIA	SPX 2X4 4800LM 80CRI 40K BFR LUGR MIN1 ZT MVOLT XXXX	COOPER, PHILIPS	RECESSED	LED, 4000K	4800 LUMENS	34	120	ARCHITECT TO SELECT FINISH.
A1E	SAME AS FIXTURE "A1" EXCEPT WITH INTEGRAL BATTERY PACK.	LITHONIA	SPX 2X4 4800LM 80CRI 40K BFR LUGR MIN1 ZT MVOLT E10WLCP XXXX	COOPER, PHILIPS	RECESSED	LED, 4000K	4800 LUMENS	34	120	ARCHITECT TO SELECT FINISH.
A2	2'X4" LAY-IN LED TROFFER WITH 22-GUAGE POWDER STEEL AND AMATTE WHITE POWDER PAINT FOR IMPROVED AESTHETICS.	LITHONIA	SPX 2X4 3000LM 80CRI 40K BFR LUGR MIN1 ZT MVOLT XXXX	COOPER, PHILIPS	RECESSED	LED, 4000K	3000 LUMENS	30	120	ARCHITECT TO SELECT FINISH.
A2E	SAME AS FIXTURE "A2" EXCEPT WITH INTEGRAL BATTERY PACK.	LITHONIA	SPX 2X4 3000LM 80CRI 40K BFR LUGR MIN1 ZT MVOLT E10WLCP XXXX	COOPER, PHILIPS	RECESSED	LED, 4000K	3000 LUMENS	30	120	ARCHITECT TO SELECT FINISH.
I	LINEAR LED STRIP WITH SNAP ON ACRYLIC LENS AND AIRCRAFT CABLE SUSPENSION.	LITHONIA	ZL1N L48 3000LM FST MVOLT 40K 80CRI WH ZACVH	COOPER, PHILIPS	PENDANT	LED, 4000K	3000 LUMENS	25	120	
K	2'X4' LAY-IN-WET LOCATION TROFFER WITH ALUMINUM DOOR FRAME, FLAT FROSTED ACRYLIC LENS,IP65 LISTING.	LITHONIA	2WRTL G L48 7000LM 0AW AFL MVOLT EZ1 40K 80CRI	COOPER, PHILIPS	RECESSED	LED, 4000K	7000 LUMENS	59	120	
KE	2'X4' LAY-IN-WET LOCATION TROFFER WITH ALUMINUM DOOR FRAME, FLAT FROSTED ACRYLIC LENS,IP65 LISTING WITH INTEGRAL BATTERY PACK.	LITHONIA	2WRTL G L48 7000LM 0AW AFL MVOLT EZ1 40K 80CRI E10WLCP	COOPER, PHILIPS	RECESSED	LED, 4000K	7000 LUMENS	59	120	
X1	SINGLE FACE, EXIT SIGN WITH INTEGRAL BATTERY PACK.	LITHONIA	LQC 1 R EL N	COOPER, PHILIPS	UNIVERSAL	N/A	N/A	1	120	
Z1	LED WALL PACK WITH COLD WEATHER INTEGRAL 90 MINUTE BATTERY PACK.	LITHONIA	ARC1 LED P2 30K MVOLT E4WH XXXX	COOPER, PHILIPS	WALL	LED, 3000K	2000 LUMENS	17	120	ARCHITECT TO SELECT FINISH. MOUNT ABOVE DOOR. COORDINATE MOUNTING OF FIXTURE WITH CANOPY.
Z2	LED WALL PACK.	LITHONIA	TWX2 LED P2 30K MVOLT PE XXXX	COOPER, PHILIPS	WALL	LED, 4000K	3450 LUMENS	28	120	ARCHITECT TO SELECT FINISH. MOUNT AT 12'-0" AFF.

ELEC - EQUIPMENT CONNECTION SCHEDULE

EQUIP ID	DESCRIPTION	DISCONNECT MEANS	VOLTAGE	POLES	HP	POWER (kVA)	REMARKS
AHU-1	DUCTLESS SPLIT SYSTEM (INDOOR UNIT)	EC TO PROVIDE SAFETY SWITCH AT UNIT	208	2		1.87	
CHP-015	HEAT PUMP	DISCONNECT FURNISHED WITH EQUIPMENT	208	2		2.08	
CU-1	DUCTLESS SPLIT SYSTEM (OUTDOOR UNIT)	EC TO PROVIDE SAFETY SWITCH AT UNIT	208	2		1.87	
DAC-1	DOOR AIR CURTAIN	EC TO PROVIDE SAFETY SWITCH AT UNIT	208	2	1/6	9.57	
DEF-1	EXHAUST FAN	EC TO PROVIDE SAFETY SWITCH AT UNIT	120	1	1/3	0.86	
DP-1	RECIRCULATING PUMP	EC TO PROVIDE MOTOR RATED TOGGLE SWITCH	120	1		1.00	
EF-1	EXHAUST FAN	EC TO PROVIDE SAFETY SWITCH AT UNIT	120	1	1/8	1.00	
EF-2	EXHAUST FAN	EC TO PROVIDE SAFETY SWITCH AT UNIT	120	1	1/60	1.00	
EF-3	EXHAUST FAN	EC TO PROVIDE SAFETY SWITCH AT UNIT	120	1	1/60	1.00	
EF-4	EXHAUST FAN	EC TO PROVIDE SAFETY SWITCH AT UNIT	120	1	1/8	1.00	
HHP-024	HEAT PUMP	DISCONNECT FURNISHED WITH EQUIPMENT	208	3		4.32	
KEF-1	EXHAUST FAN	EC TO PROVIDE SAFETY SWITCH AT UNIT	208	3	3	3.96	
MAU-1	MAKE-UP AIR UNIT	EC TO PROVIDE SAFETY SWITCH AT UNIT	208	2		3.95	
RTU-1	ROOFTOP UNIT	DISCONNECT FURNISHED WITH EQUIPMENT	208	3		22.34	
RTU-2	ROOFTOP UNIT	DISCONNECT FURNISHED WITH EQUIPMENT	208	3		22.34	
WH-1	WATER HEATER	EC TO PROVIDE MOTOR RATED TOGGLE SWITCH	120	1		1.00	

SHERMAN CARTER BARNHART ARCHITECTS

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG #23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ELECTRICAL SCHEDULES

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

REVISIONS

No.	Description	Date

SHEET

E6.1

PANELBOARD AND WIRING SCHEDULE

PANEL: K1 | **MAINS TYPE:** MLO | **SCCR (kA):**
VOLTAGE: 208Y/120V,3P,4W | **SPD:** Yes | **AVAIL FAULT CURRENT (kA):** 65k
AMPERES: 400 A | **MOUNTING:** SURFACE | **SUPPLY FROM:** EXISTING MDP

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
LTNG. - KITCHEN 167				20	1	1	1.8	1.3					2	3	20				KEF-1
AHU-1				20	2	3			0.9	1.3			4						
						5					0.9	1.3	6						
CU-1				20	2	7	0.9	4.8					8	2	60				DAC-1
						9			0.9	4.8			10						
DOOR BELL				20	1	11					0.0		12						
						13							14						
						15							16						
						17							18						
						19							20						
						21							22						
						23							24						
						25							26						
						27							28						
						29							30						
						31							32						
						33							34						
						35							36						
						37							38						
						39							40						
						41							42						
						43							44						
						45							46						
						47							48						
						49							50						
						51							52						
						53							54						
						55							56						
						57							58						
						59							60						
						61							62						
						63							64						
						65							66						
						67							68						
						69							70						
SPACE	--	--	--	--	1	71					--	--	72	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	73	--	--					74	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	75			--	--			76	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	77					--	--	78	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	79	--	--					80	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	81			--	--			82	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	83					--	--	84	1	--	--	--	--	SPACE
						TOTAL LOAD (kVA):	8.9 kVA		8.0 kVA		2.3 kVA								
						TOTAL CURRENT (A):	81 A		74 A		19 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	17270 VA	100.00%	17270 VA	TOTAL CONNECTED LOAD:	19 kVA
LTNG	1817 VA	100.00%	1817 VA	TOTAL ESTIMATED DEMAND:	19 kVA
				TOTAL CONNECTED CURRENT:	53 A
				TOTAL ESTIMATED DEMAND CURRENT:	53 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: L1 | **MAINS TYPE:** MLO | **SCCR (kA):**
VOLTAGE: 208Y/120V,3P,4W | **SPD:** Yes | **AVAIL FAULT CURRENT (kA):** 22k
AMPERES: 100 A | **MOUNTING:** FLUSH | **SUPPLY FROM:** EXISTING MDP

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
LTNG. - CAFETERIA 164				20	1	1	1.2	0.7					2	1	20				LTNG. - CLASSROOMS 163
LTNG. - NURSE/GUIDANCE 155				20	1	3			0.3	0.2			4	1	20				LTNG - EXTERIOR
LTNG				20	1	5					0.2	0.0	6	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	7	0.0	0.0					8	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	9			0.0	0.0			10	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	11					0.0	0.0	12	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	13	0.0	0.0					14	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	15			0.0	0.0			16	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	17					0.0	0.0	18	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	19	0.0	0.0					20	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	21			0.0	0.0			22	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	23					0.0	0.0	24	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	25	0.0	0.0					26	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	27			0.0	0.0			28	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	29					0.0	0.0	30	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	31	0.0	0.0					32	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	33			0.0	0.0			34	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	35					0.0	0.0	36	1	20	--	--	--	SPARE
SPACE	--	--	--	--	1	37	--	--					38	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	39			--	--			40	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	41					--	--	42	1	--	--	--	--	SPACE
						TOTAL LOAD (kVA):	1.9 kVA		0.5 kVA		0.2 kVA								
						TOTAL CURRENT (A):	16 A		5 A		2 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
LTNG	2580 VA	100.00%	2580 VA	TOTAL CONNECTED LOAD:	3 kVA
				TOTAL ESTIMATED DEMAND:	3 kVA
				TOTAL CONNECTED CURRENT:	7 A
				TOTAL ESTIMATED DEMAND CURRENT:	7 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: P1 | **MAINS TYPE:** MLO | **SCCR (kA):**
VOLTAGE: 208Y/120V,3P,4W | **SPD:** Yes | **AVAIL FAULT CURRENT (kA):** 22k
AMPERES: 225 A | **MOUNTING:** FLUSH | **SUPPLY FROM:** EXISTING MDP

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
REC				20	1	1	0.9	0.4					2	1	20				REC
REC				20	1	3			1.1	0.4			4	1	20				REC
REC				20	1	5					1.1	0.9	6	1	20				REC
REC - EXTERIOR				20	1	7	0.7	0.2					8	1	20				REC - REFRIDGERATOR
REC				20	1	9			1.4	0.9			10	1	20				REC - EXTERIOR
REC - MOTORIZED BED				20	1	11					0.2	0.9	12	1	20				REC
REC				20	1	13	0.9	0.9					14	1	20				REC
REC				20	1	15			1.1	0.9			16	1	20				REC
REC				20	1	17					1.8	1.0	18	1	20				HAND DRYER
ELECTRIC WATER COOLER				20	1	19	0.2	1.0					20	1	20				HAND DRYER
HAND DRYER				20	1	21			1.0	0.2			22	1	20				ELECTRIC WATER COOLER
HAND DRYER				20	1	23					1.0	1.4	24	1	20				REC
HAND DRYER				20	1	25	1.0	1.0					26	1	20				HAND DRYER
REC				20	1	27			1.4	1.0			28	1	20				HAND DRYER
REC				20	1	29					0.2	0.0	30	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	31	0.0	0.0					32	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	33			0.0	0.0			34	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	35					0.0	0.0	36	1	20	--	--	--	SPARE
SPACE	--	--	--	--	1	37	--	--					38	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	39			--	--			40	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	41					--	--	42	1	--	--	--	--	SPACE
						TOTAL LOAD (kVA):	7.1 kVA		9.4 kVA		8.5 kVA								
						TOTAL CURRENT (A):	60 A		80 A		72 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	7000 VA	100.00%	7000 VA	TOTAL CONNECTED LOAD:	25 kVA
REC	18000 VA	77.78%	14000 VA	TOTAL ESTIMATED DEMAND:	21 kVA
				TOTAL CONNECTED CURRENT:	69 A
				TOTAL ESTIMATED DEMAND CURRENT:	58 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: M1 | **MAINS TYPE:** MLO | **SCCR (kA):**
VOLTAGE: 208Y/120V,3P,4W | **SPD:** Yes | **AVAIL FAULT CURRENT (kA):** 35k
AMPERES: 225 A | **MOUNTING:** FLUSH | **SUPPLY FROM:** EXISTING MDP

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
RTU-1				80	3	1	7.4	7.4					2	3	80				RTU-2
						3			7.4	7.4			4						
						5					7.4	7.4	6						
MAU-1				30	2	7	2.0	1.4					8	3	20				HHP-024
						9			2.0	1.4			10						
DEF-1				20	1	11					0.9	1.4	12						
EF-1				20	1	13	1.0	1.0					14	1	20				EF-2
EF-3				20	1	15			1.0	1.0			16	1	20				EF-4
CHP-015				20	2	17					1.0	1.0	18	2	20				CHP-015
						19	1.0	1.0					20						
CHP-015				20	2	21			1.0	1.0			22	2	20				CHP-015
						23					1.0	1.0	24						
SPARE	--	--	--	20	1	25	0.0	0.0					26	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	27			0.0	0.0			28	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	29					0.0	0.0	30	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	31	0.0	0.0					32	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	33			0.0	0.0			34	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	35					0.0	0.0	36	1	20	--	--	--	SPARE
SPACE	--	--	--	--	1	37	--	--					38	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	39			--	--			40	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	41					--	--	42	1	--	--	--	--	SPACE
						TOTAL LOAD (kVA):	22.4 kVA		22.4 kVA		21.4 kVA								
						TOTAL CURRENT (A):	188 A		188 A		178 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	66130 VA	100.00%	66130 VA	TOTAL CONNECTED LOAD:	66 kVA
				TOTAL ESTIMATED DEMAND:	66 kVA
				TOTAL CONNECTED CURRENT:	184 A
				TOTAL ESTIMATED DEMAND CURRENT:	184 A

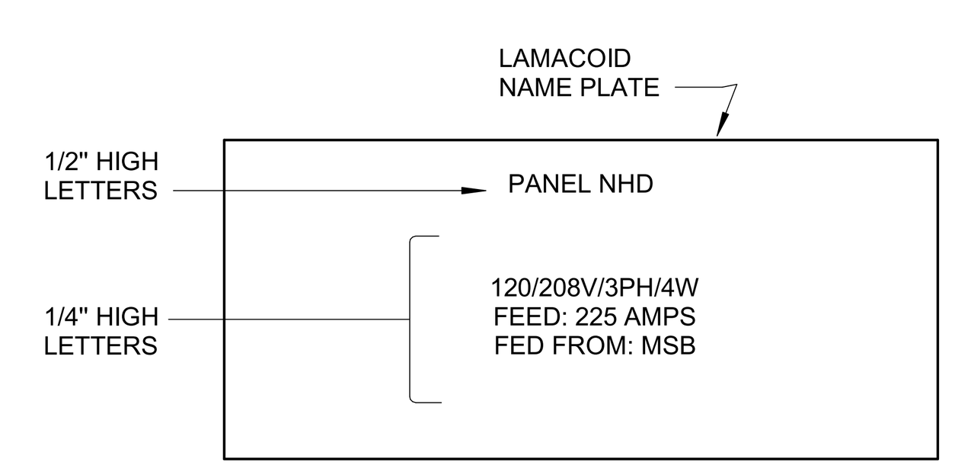
NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD SCHEDULE SYMBOLS :

GFI	PROVIDE GROUND FAULT CIRCUIT INTERRUPTER TYPE CIRCUIT BREAKER
MLO	MAIN LUG ONLY
MCB	MAIN CIRCUIT BREAKER
VFD	VARIABLE FREQUENCY DRIVE

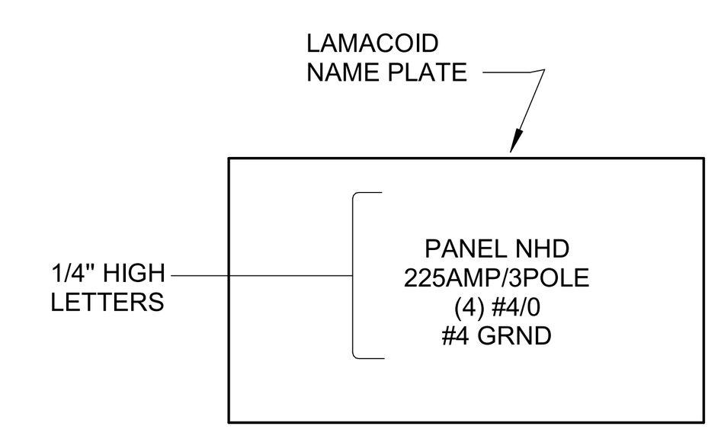
PANELBOARD SCHEDULE NOTES :

A. ALL NEW PANELBOARDS SHALL BE ORDERED WITH "DOOR-IN-DOOR" OPTION.
B. PROVIDE LOCK-OUT TYPE CIRCUIT BREAKERS FOR ALL HARD-WIRED EQUIPMENT.
C. CIRCUIT BREAKERS SERVING HVAC EQUIPMENT SHALL BE HACR TYPE.
D. PROVIDE TYPEWRITTEN SCHEDULES AT ALL PANELBOARDS. INDICATE ROOM NUMBERS BEING SERVED BY CIRCUIT ON SCHEDULE.
E. PROVIDE SIX (6) SPARE 1" CONDUITS STUBBED INTO ACCESSIBLE CEILING SPACE FROM ALL NEW RECESSED PANELBOARDS.
F. PROVIDE SIX (6) SPARE 1" CONDUITS STUBBED INTO ACCESSIBLE CEILING SPACE OF FLOOR BELOW FROM ALL NEW RECESSED PANELBOARDS.



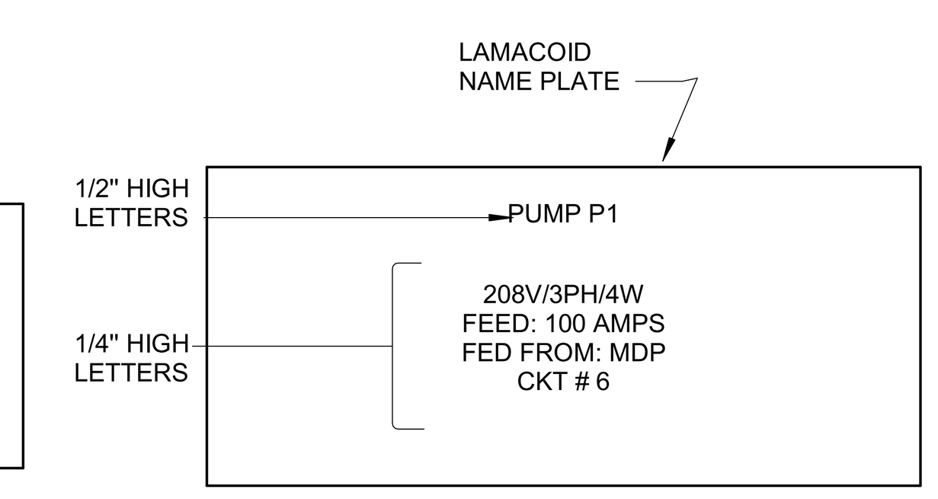
NORMAL POWER LABELS SHALL BE BLACK WITH WHITE LETTERS. EMERGENCY POWER LABELS SHALL BE RED WITH WHITE LETTERS UTILIZE SCREW-ON TYPE LAMACOID PLATES.

TYPICAL POWER PANELBOARD NAMEPLATE DETAIL
NO SCALE



NORMAL POWER LABELS SHALL BE BLACK WITH WHITE LETTERS. EMERGENCY POWER LABELS SHALL BE RED WITH WHITE LETTERS UTILIZE SCREW-ON TYPE LAMACOID PLATES.

TYPICAL SWITCHBOARD AND DISTRIBUTION PANELBOARD CIRCUIT LABEL NAMEPLATE DETAIL
NO SCALE



NORMAL POWER LABELS SHALL BE BLACK WITH WHITE LETTERS. EMERGENCY POWER LABELS SHALL BE RED WITH WHITE LETTERS UTILIZE SCREW-ON TYPE LAMACOID PLATES.

TYPICAL DISCONNECT AND COMBINATION STARTER/DISCONNECT NAMEPLATE DETAIL
NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG #: 23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

PANEL SCHEDULES

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

REVISIONS

No.	Description	Date

SHEET

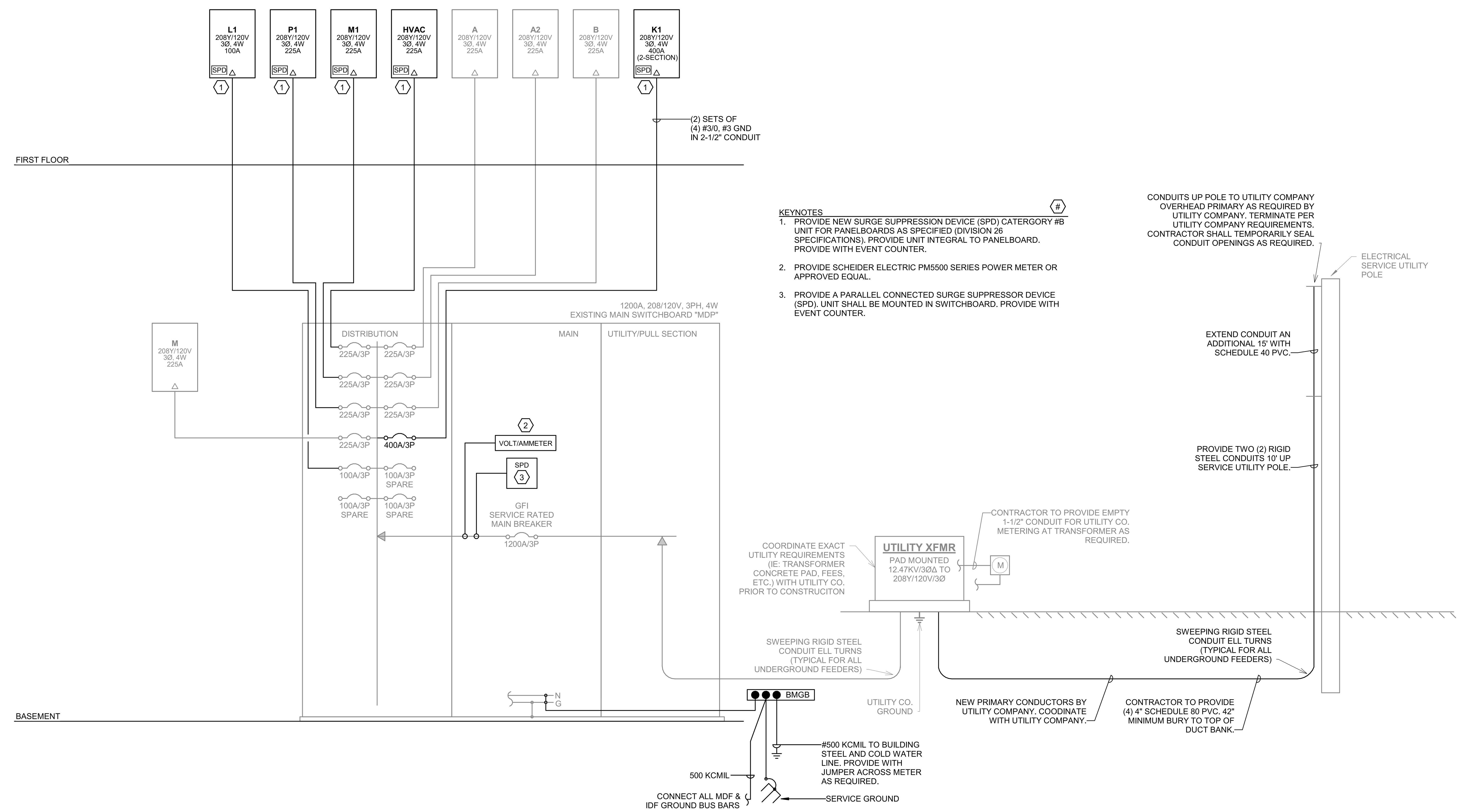
E6.2

GENERAL NOTES (RISER):

A. ALL NEW CONDUCTORS SHALL BE COPPER (REFER TO SPECIFICATIONS FOR TYPES).
B. REFER TO DETAILS FOR TYPICAL PANEL LABELING REQUIREMENTS.
C. REFER TO PANEL SCHEDULES FOR EQUIPMENT ACCESSORIES, BREAKER SIZES, AND RELATED INFORMATION.
D. AS PART OF THIS CONTRACT, PROVIDE A COMPREHENSIVE ARC FLASH HAZARD ANALYSIS FOR ALL POWER DISTRIBUTION DEVICES ON THIS PROJECT. PROVIDE ALL LABELS, WARNING SIGNAGE, ETC. PER NPFA-70E AND OSHA REQUIREMENTS. ALL LABELS SHALL BE AFFIXED PRIOR TO FINAL ELECTRICAL INSPECTIONS. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL DATA TO THE SWITCHGEAR MANUFACTURER NO LATER THAN TWO WEEKS FOLLOWING AWARD OF PROJECT AS REQUIRED TO COMPLETE THE ANALYSIS. STUDY SHALL INCLUDE ALL EXISTING EQUIPMENT IN EXISTING FACILITY. REFER TO SPECIFICATION SECTION 260573, "ELECTRICAL STUDIES", FOR ADDITIONAL REQUIREMENTS.
E. AS PART OF THIS CONTRACT, PROVIDE A COORDINATION/FAULT CURRENT STUDY FOR BREAKERS ON THIS PROJECT. STUDY SHALL INCLUDE ALL MAINS AND FEEDERS SHOWN ON THESE DRAWINGS AND SHALL EXTEND TO THE MAIN LUGS OR BREAKER OF THE FURTHEST DEVICE DOWNSTREAM. THE EMERGENCY POWER SYSTEMS SHALL BE SELECTIVELY COORDINATED TO 0.1 SECONDS THROUGH BOTH THE UTILITY AND GENERATOR DERIVED SYSTEMS. EQUIPMENT PRESENTLY SHOWN IS THE BASIS OF DESIGN - OTHER MANUFACTURERS LISTED AS EQUALS MAY NEED TO MODIFY LAYOUTS AND EQUIPMENT IN ORDER TO MEET THIS REQUIREMENT. ALL MANUFACTURERS MUST UTILIZE ELECTRONIC TRIP BREAKERS WITH ADJUSTABLE TRIP SETTINGS WHERE REQUIRED TO MEET SELECTIVE COORDINATION REQUIREMENTS. WHERE MODIFICATION TO EQUIPMENT INDICATED ON THESE DRAWINGS IS REQUIRED IN ORDER TO ACHIEVE COORDINATION, THESE CHANGES SHALL BE CLEARLY NOTED IN THE STUDY. WHERE ACTUAL BREAKER AMPACITIES ARE INCREASED TO ACHIEVE COORDINATION, THE CONTRACTOR IS RESPONSIBLE FOR INCLUDING ALL COST ASSOCIATED WITH THESE CHANGES IN THEIR BID (INCLUDING INCREASES IN FEEDER SIZES). SUBMIT STUDY AS SHOP DRAWING TO ENGINEER PRIOR TO ORDERING ANY POWER DISTRIBUTION EQUIPMENT. ANY EQUIPMENT SUBMITTED PRIOR TO SUBMISSION OF THIS STUDY WILL NOT BE REVIEWED. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL DATA TO THE SWITCHGEAR MANUFACTURER NO LATER THAN TWO WEEKS FOLLOWING AWARD OF PROJECT AS REQUIRED TO COMPLETE THE ANALYSIS. REFER TO SPECIFICATION SECTION 260573, "ELECTRICAL STUDIES", FOR ADDITIONAL REQUIREMENTS.
F. AS PART OF THIS CONTRACT, PROVIDE AN IEEE 1547 CERTIFICATION.
G. THERMAL SCAN OF PANEL AND LARGE EQUIPMENT TERMINATIONS SHALL BE PROVIDED TO OWNER AT COMPLETION OF PROJECT. CONTRACTOR TO CORRECT DIFICIENCIES DISCOVERED AT NO ADDITIONAL COST TO CONTRACT.
H. POWER INTERRUPTIONS SHALL BE PLANNED WITH TWO WEEK MINIMUM NOTICE PRIOR TO INTERRUPTION TO EXISTING FACILITY POWER. CONTRACTOR SHALL COORDINATE ALL EXPECTED PROCEDURES WITH OWNER AND ALL LOCAL INSPECTION AGENCIES. ONE MONTH PRIOR TO INTERRUPTING POWER, CONTRACTOR SHALL SUBMIT TO ENGINEER A DETAILED OUTLINE AND DESCRIPTION OF HOW THIS PROCEDURE IS TO TAKE PLACE, FOR HOW LONG POWER WIL BE DOWN, WHO HAS BEEN CONTACTED, ETC. THIS OUTLINE AND DESCRIPTION IS TO BE SUBMITTED AS SHOP DRAWINGS TO THE ENGINEER FOR REVIEW. NO INTERRUPTION OF MAIN SERVICE POWER SHALL OCCUR WITHOUT THE ENGINEER'S WRITTEN APPROVAL OF THE ABOVE REFERENCED MATERIAL.
I. REFER TO PANEL AND EQUIPMENT SCHEDULES FOR FEEDER AND OVERCURRENT DEVICE SIZES.
J. SERVICE EQUIPMENT SHALL BE MARKED WITH THE MAXIUM AVAILABLE FAULT-CURRENT AT THE EQUIPMENT AND THE DATE THE CALCULATION WAS PERFORMED. APPLY A TYPE-WRITTEN ADHESIVE LABEL WITH WHITE BACKGROUND 1/2" HIGH BLACK LETTERING.
K. ALL SPD'S SHALL BE INTERNALLY MOUNTED.
L. ALL UN-USED SPACES WITHIN SWITCHBOARD, DISTRIBUTION PANELBOARDS AND PANELBOARDS SHALL BE "PREPARRED SPACES" THAT ALLOW EACH INSTALLATION OF A CIRCUIT BREAKER.

ELEC RISER - FEEDER SCHEDULE

EQUIPMENT NAME	FED FROM	VOLTAGE	RATING	SETS	WIRE SIZE	GROUND SIZE	CONDUIT SIZE	WIRE TYPE
K1	EXISTING MDP	208 V	400 A	2	(4) #3/0	#3	2-1/2"C	THWN
L1	EXISTING MDP	208 V	100 A	1	(4) #3	#8	1-1/2"C	THWN
M1	EXISTING MDP	208 V	225 A	1	(4) #4/0	#4	3"C	THWN
P1	EXISTING MDP	208 V	225 A	1	(4) #4/0	#4	3"C	THWN



KEYNOTES

1. PROVIDE NEW SURGE SUPPRESSION DEVICE (SPD) CATERGORY #B UNIT FOR PANELBOARDS AS SPECIFIED (DIVISION 26 SPECIFICATIONS). PROVIDE UNIT INTEGRAL TO PANELBOARD. PROVIDE WITH EVENT COUNTER.
2. PROVIDE SCHEIDER ELECTRIC PM5500 SERIES POWER METER OR APPROVED EQUAL.
3. PROVIDE A PARALLEL CONNECTED SURGE SUPPRESSOR DEVICE (SPD). UNIT SHALL BE MOUNTED IN SWITCHBOARD. PROVIDE WITH EVENT COUNTER.

1 ELECTRICAL DISTRIBUTION RISER DIAGRAM
NO SCALE

SHERMAN CARTER BARNHART ARCHITECTS

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG #23-277
HART COUNTY BOARD OF EDUCATION
HORSE CAVE, KY

ELECTRICAL DISTRIBUTION RISER DIAGRAM

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

REVISIONS

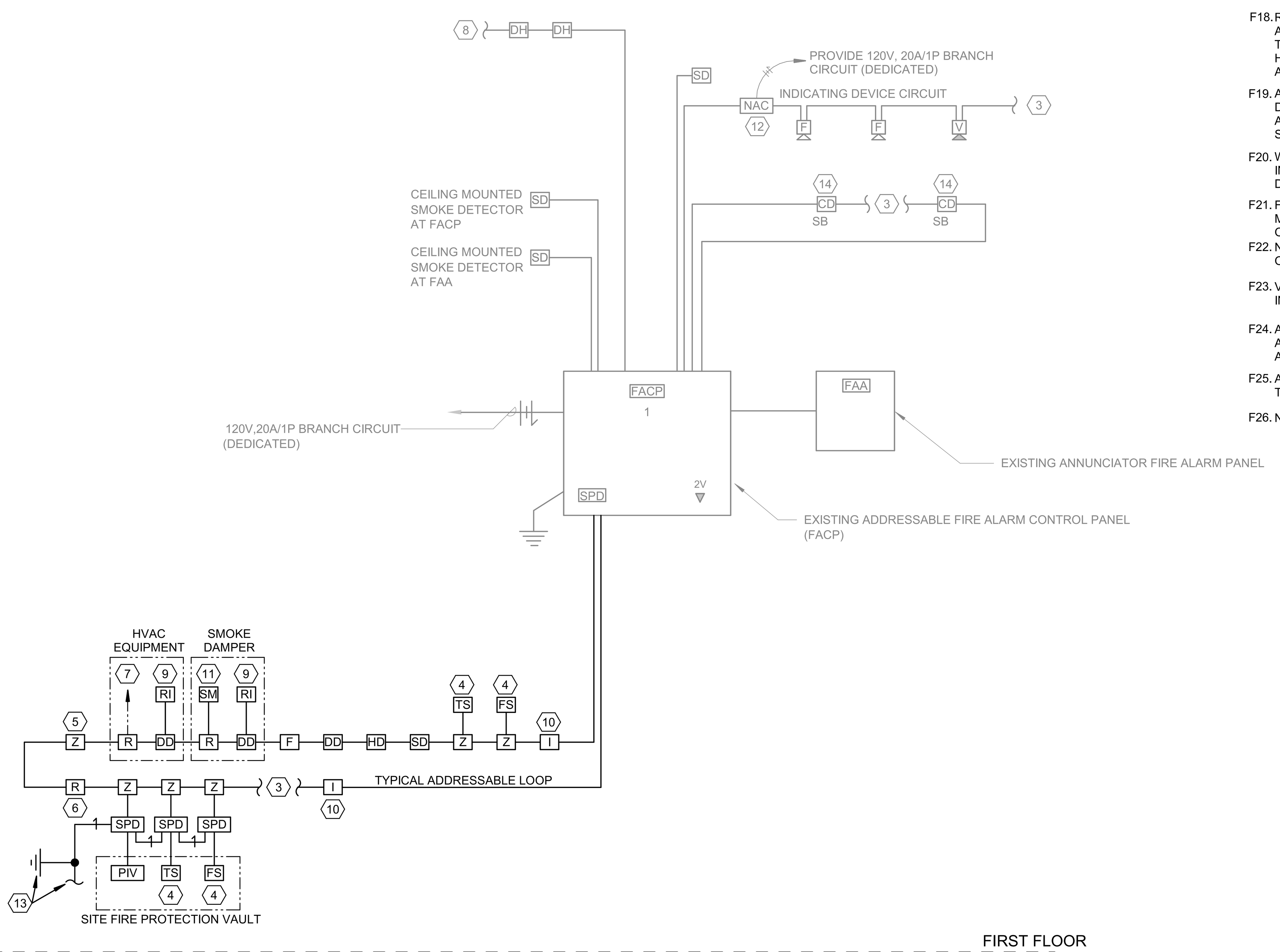
No.	Description	Date

SHEET
E7.1

1506.2
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/2/2023 9:26:23 AM

TAGGED NOTES:

1. NOT USED.
2. NOT USED.
3. TO ALL OTHER DEVICES ON LOOP/CIRCUIT AS REQUIRED. REFER TO FLOOR PLAN FOR PROPOSED DEVICE LOCATIONS.
4. COORDINATE WITH DRAWINGS FOR ACTUAL NUMBER OF TAMPER, FLOW AND PRESSURE SWITCHES REQUIRED TO BE MONITORED ON THE FIRE SUPPRESSION RISER AND THE SUPPRESSION ZONES ON EACH FLOOR.
5. PROVIDE ZONE ADDRESSABLE MODULE FOR SUPERVISION OF ANCILLARY FIRE PROTECTION/MONITORING SYSTEMS. DEVICE SHALL BE SURFACE MOUNTED IN NEMA-1 ENCLOSURE, ABOVE SUSPENDED CEILING. PROVIDE QUANTITY AND TYPE AS REQUIRED FOR:
   - 5.1. FIRE PROTECTION TAMPER, FLOW AND PRESSURE SWITCHES.
   - 5.2. FIRE PROTECTION POST-INDICATOR VALVE.
   - 5.3. DRY/CHEMICAL FIRE SUPPRESSION SYSTEMS.
6. PROVIDE ADDRESSABLE FIRE ALARM RELAY FOR SIGNAL OUTPUT TO ANCILLARY BUILDING SYSTEMS. DEVICE SHALL BE SURFACE MOUNTED IN NEMA-1 ENCLOSURE, ABOVE SUSPENDED CEILING. PROVIDE QUANTITY AND TYPE AS REQUIRED FOR:
   - 6.1. OPERABLE FIRE SHUTTERS TO CLOSE ON FIRE ALARM.
   - 6.2. ACCESS CONTROL DOORS TO UNLOCK AND POSITIVELY LATCH ON FIRE ALARM.
   - 6.3. ELEVATOR FOR ALL SPECIFIED AND REQUIRED FUNCTIONS.
7. ROUTE CONTROL WIRING (IN CONDUIT) BACK TO NEW HVAC EQUIPMENT CONTROLS FOR AUTOMATIC SHUTDOWN.
8. TO ALL OTHER DOOR HOLDERS ON INDICATED FLOOR. DOOR HOLDERS SHALL BE POWERED FROM THE FIRE ALARM SYSTEM CABINETS AND SHALL RELEASE ON FIRE ALARM AS REQUIRED. REFER TO ARCHITECTURAL DOOR HARDWARE SCHEDULES AND DIVISION 8 AND 28 SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
9. PROVIDE NEW FLUSH-MOUNTED REMOTE ALARM/POWER INDICATING KEY RESET/TEST STATION ON CORRIDOR WALL (WHENEVER POSSIBLE) AT 7'- 6" AFF BELOW SMOKE DAMPER/DUCT SMOKE DETECTOR LOCATION AS REQUIRED.
10. PROVIDE AN "ISOLATOR MODULE" AT ALL BRANCH RUNS. MOUNT IN A SURFACE NEMA-1 ENCLOSURE ABOVE THE SUSPENDED CEILING. PROVIDE AS REQUIRED BY SYSTEM MANUFACTURER TO ISOLATE LOOPS ON EACH FLOOR AND WITHIN EACH SMOKE COMPARTMENT.
11. ROUTE 120V POWER WIRING THROUGH ADDRESSABLE RELAY MODULE FOR CONTROL OF DAMPER VIA ASSOCIATED DUCT/AREA SMOKE DETECTOR.
12. PROVIDE NUMBER OF NOTIFICATION APPLIANCE POWER SUPPLIES, ASSOCIATED 120V CIRCUITS, AND SMOKE DETECTORS WITHIN 5'-0" OF NAC PANELS AS REQUIRED. LOCATE IN ELECTRICAL ROOMS. SUBMIT PROPOSED LOCATIONS IN SHOP DRAWINGS FOR REVIEW.
13. PROVIDE SURGE PROTECTION DEVICE AT POINT OF CONDUIT ENTRANCE INTO BUILDING. PROVIDE 5/8" X 10'-0" COPPER-WELD GROUND ROD AT PERIMETER OF BUILDING NEXT TO CONDUIT ENTRANCE AND CONNECT TO SPD'S, COLD WATER LINE, AND BUILDING STEEL WITH #3 AWG INSULATED GROUND IN 3/4" CONDUIT.
14. ALL CARBON MONIXIDE SOUNDER BASES SHALL SOUND TOGETHER.



1 FIRE ALARM SYSTEM RISER DIAGRAM

NO SCALE

FIRE ALARM SYSTEM GENERAL NOTES:

F1. PROVIDE AN INTELLIGENT ADDRESSABLE VOICE FIRE ALARM SYSTEM FOR THE NEW FACILITY. THIS FIRE ALARM SYSTEM SHALL BE CAPABLE OF MONITORING THE INCOMING FIRE SUPPRESSION RISER, MANUAL PULL-STATIONS, ALL CEILING MOUNTED AUTOMATIC SMOKE AND HEAT DETECTORS AND ALL DUCT-MOUNTED AUTOMATIC SMOKE DETECTORS. IN ADDITION, PROVIDE THIS SYSTEM WITH A DIGITAL DIALER CONNECTED TO A MONITORING SERVICE SO THAT THE PROPER AUTHORITIES ARE NOTIFIED IN THE EVENT OF AN ALARM CONDITION.

F2. THIS RISER IS PARTIAL. ALL THE DEVICES CONNECTED TO THE FIRE ALARM CONTROL PANEL (FACP) UNITS ARE NOT SHOWN. THE CONTRACTOR SHALL REFER TO THE ELECTRICAL FLOOR PLANS FOR ADDITIONAL REQUIREMENTS.

F3. ANNUNCIATE ALL INDIVIDUAL FIRE ALARM DEVICES AS WELL AS AUXILIARY FUNCTIONS AT EACH ANNUNCIATOR. REFER TO SPECIFICATIONS, AS WELL AS GENERAL NOTES AND SCHEDULES THIS SHEET.

F4. FIELD VERIFY THE EXACT NUMBERS AND LOCATIONS OF ALL MECHANICAL RELATED ITEMS (EX. SPRINKLER CONNECTIONS, EXSTINGUISHING SYSTEMS, SMOKE DAMPERS, ETC.) AND MAKE CONNECTIONS AS REQUIRED/INDICATED.

F5. WRITTEN CERTIFICATION OF ENTIRE FIRE ALARM SYSTEM SHALL BE SUBMITTED TO OWNER AND CMTA AT CLOSE OF PROJECT.

F6. PROVIDE A DUCT-MOUNTED SMOKE DETECTOR IN THE DUCTWORK SERVING EACH AUTOMATIC FIRE/SMOKE DAMPER. THESE DETECTORS ARE TO MONITOR THE DUCT OPENING IN A SMOKE OR FIRE RATED PARTITION. THESE DETECTORS ARE TO BE PROVIDED WITH AN AUXILIARY, 24V, NORMALLY-CLOSED, RELAY WHICH HOLDS THE DAMPER OPEN. THIS RELAY IS TO KEEP THE DAMPER OPEN UNDER NORMAL CONDITIONS, THIS RELAY IS TO BE WIRED SO THAT IT OPENS, THUS ALLOWING THE DAMPER TO CLOSE, IN THE EVENT OF AN ALARM OR LOSS OF POWER CONDITION. THESE DETECTORS ARE TO BE SUPPLIED AND CONNECTED TO THE FIRE ALARM SYSTEM BY THE ELECTRICAL CONTRACTOR AND SHALL BE INSTALLED IN THE DUCTWORK BY THE MECHANICAL CONTRACTOR.

F7. PROVIDE ADDRESSABLE NOTIFICATION APPLIANCES WITH THIS SYSTEM. THESE APPLIANCES ARE TO BE WHITE WITH RED LETTERING. AUDIBLE NOTIFICATION APPLIANCES ARE TO UTILIZE AN AUDIBLE HORN SETTING AT A MINMINUM OF 87dB. VISUAL NOTIFICATION APPLIANCES SHALL BE CAPABLE OF MULTIPLE CANDELA SETTINGS UP TO 110 CANDELAS. ALL CONDUIT IN THE FIRE ALARM SYSTEM SHALL BE 3/4" SIZE EXCEPT AS OTHERWISE NOTED. PROVIDE LARGER CONDUIT IF REQUIRED TO MAINAIN CONDUCTORS AT 40% MAXIMUM FILL.

F8. FIRE ALARM MANUAL STATIONS SHALL BE DOUBLE-ACTION TYPE, POSITIVE VISUAL INDICATION OF OPERATION, KEY RESET, AND ALL SHOULD BE KEYED ALIKE.

F9. AVOID PLACEMENT OF HEAT DETECTORS CLOSE TO HEAT-PRODUCING EQUIPMENT WHERE RATE-OF-RISE WILL DEGRADE DETECTOR PERFORMANCE OR PRODUCE NUISANCE ALARMS. USE DEVICES CAPABLE FIXED TEMPERATURE (165 F TO 200 F) DETECTION IN SUCH AREAS.

F10. THE ENTIRE FIRE ALARM SYSTEM INSTALLATION SHALL BE IN FULL ACCORDANCE WITH THE CURRENT EDITION OF NFPA, KBC, AMERICANS WITH DISABILITIES ACT AND ALL OTHER APPLICABLE CODES.

F11. COORDINATE WITH THE DOOR HARDWARE SET SPECIFICATIONS AND THE OWNER'S SECURITY REPRESENTATIVE TO VERIFY THE DOORS THAT WILL REQUIRE CONNECTION TO THE FIRE ALARM SYSTEM.

F12. ALL TAMPER, FLOW AND PRESSURE SWITHCES THAT ARE PROVIDED IN THE CONTRACT SHALL BE CONNECTED TO THE FIRE ALARM SYSTEM BY FIRE ALARM CONTRACTOR. WHERE IN UNDERGROUND VAULTS, USE SEALED WATERPROOF CONNECTORS AND SWITCHES. REFER TO FIRE SUPPRESSION SYSTEM SHOP DRAWING FOR EACH TYPE OF DEVICE AND LOCATIONS.

F13. ALL FIRE ALARM STROBE LIGHTS SHALL BE SYCRONIZED TO ACCOMIDATE BUILDING STANDARDS.

F14. ALL FIRE ALARM SYSTEM CABLING SHALL BE ROUTED IN CONDUIT. CONDUIT SHALL BE 3/4" MINIMUM OR AS REQUIREDTO SUIT CONDUCTORS. CONDUIT SHALL BE MANUFACTURED RED IN COLOR - FIELD PAINTED RED CONDUIT SHALL NOT BE ACCEPTED.

F15. PROVIDE DUCT MOUNTED SMOKE DETECTORS FOR AIR HANDLING UNITS THAT ARE 2000 CFM OR GREATER.

F16. THE SENSITIVITY OF SMOKE DETECTORS SHALL BE ADJUSTED FOR THE SERVICE DUTY IN THE AREA INDICATED, TO SUIT BUILDING OPERATIONAL CONDITIONS.

F17. WIRE SIZE SELECTIONS FOR AUDIO/VISUAL UNITS SHALL BE CALCULATED AND SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

F18. RISER DIAGRAM FOR FIRE ALARM SYSTEM IS FOR BID PURPOSES ONLY. SYSTEM SHALL BE INSTALLED AND CONNECTED IN ACCORDANCE WITH WIRING DIAGRAMS OBTAINED FROM MANUFACTURER AND THAT HAVE BEEN APPROVED BY THE STATE FIRE MARSHALL'S OFFICE OR THE LOCAL AUTHORITY HAVING JURISDICTION, AS APPLICABLE. IT IS THE RESPONIBILITY OF THE CONTRACTOR TO CONFIRM ALL QUANITIES AND LOCATION OF FIRE ALARM DEVICES PRIOR TO SYSTEM ACTIVATION.

F19. AUTOMATIC FIRE ALARM DETECTORS SHALL BE LOCATED SO AS TO PREVENT SHIELDING BY DUCTWORK, EQUIPMENT AND PIPING ON CEILING. SPACING BETWEEN DETECTORS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS IN ANY CASE. ADDITIONAL DETECTORS SHALL BE PROVIDED IF NEEDED TO INSURE COMPLETE COVERAGE OF THE INDICATED SPACE.

F20. WHEN CONNECTING TO RANGEHOOD FIRE EXTINGUISHING SYSTEM, COORDINATE WITH SYSTEM INSTALLER TO PROVIDE A NORMALLY - OPEN AUXILIARY CONTACT TO CLOSE ON SYSTEM DISCHARGE FOR ALARM.

F21. FIRE ALARM SIGNALING DEVICES SHALL BE SEMI-FLUSH TYPE AUDIBLES WITH FLASHING LAMP MOUNTED
ON SAME PLATE. SURFACE-MOUNTED UNITS MAY BE USED IN UNFINISHED AREAS.

F22. NO SMOKE DETECTORS SHALL BE LOCATED CLOSER THAN 36" TO SUPPLY, RETURN OR EXHAUST AIR OPENINGS NOR CLOSER THAN 12" TO WALL/CEILING INTERSECTIONS.

F23. VERIFY THE FINAL ROOM NAME AND NUMBERING SCHEME USED FOR ANNUNCIATOR LEGENDS IS IN ACCORD WITH THE ACTUAL ROOM NAMES AND NUMBERS FINALLY CHOSEN BY THE OWNER.

F24. ALL ANNUNCIATOR LEGEND NUMBERING AND/OR ALPHANUMERIC DISPLAY LEGENDS SHALL BE APPROVED BY THE ARCHITECT, OWNER, AND LOCAL FIRE DEPARTMENT AUTHORITY, AS APPLICABLE. SUBMIT THIS INFORMATION WITH SHOP DRAWINGS.

F25. A TECHNICAL REPRESENTATIVE OF FIRE ALARM MANUFACTURER SHALL BE PRESENT AT ALL TIMES DURING FIRE ALARM CERTIFICATION.

F26. NOT USED.

SHERMAN CARTER BARNHART ARCHITECTS

CMTA A LEGENCE Company

LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION

BG # 23-277

HART COUNTY BOARD OF EDUCATION

HORSE CAVE, KY

FIRE ALARM RISER DIAGRAM

JOB NO.	1506.2
DATE	08/03/2023
DRAWN	GDC
CHECKED	BKB

REVISIONS

No.	Description	Date

SHEET

E7.2

1506.2
LEGRANDE ELEMENTARY SCHOOL ADDITION AND RENOVATION
8/2/2023 9:26:23 AM