ELIZABETHTOWN FREEMAN LAKE PARK SHELTERS PROJECT

Project Manual
Volume 1 of 2
Divisions 00-14

CITY OF ELIZABETHTOWN, KY

December 22, 2023

CMW Project # 21049.05

VOLUME 1 OF 2 – TECHNICAL SPECIFICATIONS

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ADVERTISEMENT FOR BIDS

Notice is hereby given that the City of Elizabethtown will receive sealed bids for the Elizabethtown Freeman Lake Park Shelters Project at the office of the City Clerk, City Hall, 3rd floor, 200 West Dixie Avenue, P. O. Box 550, Elizabethtown, Kentucky 42701 until 10:00 AM EST on Thursday, January 25, 2024 at which time they will be publicly opened and read aloud. The successful bidder shall provide performance and payment bonds, proof of insurance and licenses as specified. Preference shall be given to Kentucky resident bidders and non-resident bidders from states which do not require preference to resident bidders.

Plans and specifications will be available Friday, December 22, 2023 for purchase at Lynn Imaging, 11460 Bluegrass Pkwy, Louisville, KY 40299 and 328 Old Vine St, Lexington, KY 40507. A non-refundable payment for printed documents and/or for digital download will be required for each set of bid documents.

The City of Elizabethtown reserves the right to reject any and all bids or to let the contract as a whole or for any part, and to waive any informalities or irregularities in the bids received.

INSTRUCTIONS TO BIDDERS

1.1 General Instructions

A. Each Bidder is responsible for inspecting the work site and for being thoroughly familiar with the Contract Documents. The Bidder shall in no way be relieved from any bidding obligation because of unfamiliarity with the site or documents. The City will not assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

B. Each Bidder shall be required to pay a non-refundable deposit for a copy of construction plans and bid documents.

C. All Bidders must comply with all Federal, State and City Equal Employment Opportunity laws and regulations which prohibit discrimination in employment regarding race, creed, color, sex, or national origin.

D. Wherever the words "or equal" appear in the technical notes, they shall be interpreted to mean an item of materials or equipment equal in quality to that named and which is suited to the same use and capable of performing the same function for the same duration and the same standard of operation as that named. The burden of proof of equal quality or service shall be on the Bidder. Inclusion of a certain make or type of materials or equipment in Bidder's proposal or Contractor's estimate shall not obligate the City to accept such material or equipment if it does not meet the requirements of the Contract plans or technical notes as determined by the City.

E. Substitution requests may only be made prior to the Bid Opening. Substitutions will not be permitted after awarding Contract. Submit proposed substitutions to Architect under conditions set forth in this manual.

F. All taxes are the responsibility of the successful bidder unless specifically exempted in the bidding documents.

2.1 Bidding Procedure

A. Bids will be received by the City of Elizabethtown, at the office of the City Clerk, 3rd floor, 200 West Dixie Avenue, Elizabethtown, Kentucky until 10:00 AM on Thursday, January 25, 2024, and then publicly opened and read aloud in the 3rd Floor Conference Room.

B. Bids must be submitted in a sealed envelope, addressed to the City of Elizabethtown, Attention: City Clerk, 200 West Dixie Avenue, Elizabethtown, Kentucky 42701. The Bidding envelope must be clearly marked on the outside as “**Elizabethtown Freeman Lake Park Shelters Project**“ and the envelope must bear on the outside the Bidder's name, address, Bid opening date, and time.

C. Bids must be submitted on the required Bid form. All blank spaces for Bid prices must be completed, in ink or typewritten, and the Bid form must be fully completed and

executed when submitted.

D. Quantities listed on Bid forms for unit price contracts are to be considered as approximate only and are not guaranteed as entirely accurate, but will be used in comparing bids. These quantities may be reduced or increased without incurring additional obligation other than the figures produced by the actual quantities installed at the unit prices bid.

E. The City reserves the right to add, delete, or change any part or portion of the proposed work. All such changes that affect the work shall be in the form of a Change Order that shall establish compensation. The Change Order shall be issued by the City and executed by the City and Contractor, under the conditions of the original Contract.

F. Interpretation of the meaning of the drawings, specifications or other Bidding Documents will not be made to any Bidder orally. Requests for interpretation must be in writing addressed and delivered to, or sent by email, to the following,

Jason Dailey, City of Elizabethtown, 200 West Dixie Avenue, Elizabethtown, Kentucky 42701, email: jason.dailey@elizabethtownky.gov

and

Brad Boaz, PLA, CMW, 249 East Main Street, Lexington, Kentucky 40507, email: bboaz@cmwaec.com

and received at least ten (10) calendar days prior to the fixed Bid opening date. Interpretations and supplemental instructions will be in the form of written addenda to the Bidding Documents which, if used, will be distributed to all prospective Bidders no later than seven (7) calendar days prior to the fixed Bid opening date. Failure of any Bidder to receive any such addendum or interpretation shall not relieve any Bidder from any obligation under the Bid submitted. All addenda so issued shall become part of the Contract Documents.

3.1 Award of Contract

A. Award of the Contract will be made on the basis of the best evaluated Bid price including previous performance, references, and warranties provided. The City reserves the right to reject any and all Bids, to waive any Bidding informalities, and to disregard all nonconforming, nonresponsive, or conditional Bids. Discrepancies between words and figures will be resolved in favor of words. Discrepancies between the indicated sum of any column of figures and the correct sum will be resolved in favor of the correct sum.

B. The City reserves the right to accept or reject any or all alternates bid.

C. The Bidder to whom the Contract is awarded will be required to execute the Contract and provide Insurance Certificates within fourteen (14) calendar days from the date of the Notice of Award. The Notice of Award will be accompanied by the necessary

Contract.

D. The successful Bidder must provide proof of a City of Elizabethtown business license at or before the signing of the Contract.

E. Insurance certificates for all coverage required must be provided by a corporate insurer acceptable to the City. The term of all coverage must run until the Contract completion date.

F. Within ten (10) calendar days of receipt of acceptable Insurance Certificates and Contract signed by the Bidder to whom the Contract was awarded, the City shall sign the Contract and return to such party an executed duplicate of the Contract. Should the City not execute the Contract within such a period, the Bidder may, by written notice, withdraw the signed Contract. Such notice of withdrawal shall be effective upon receipt of the notice by the City.

G. The Notice to Proceed shall be issued by the City within ten (10) calendar days of the execution of the Contract by the City. Should there be reasons why the Notice to Proceed cannot be issued within such a period, the time may be extended by mutual agreement between the City and Contractor. If the Notice to Proceed has not been issued within the specified periods or the period mutually agreed upon, the Contractor may terminate the Contract without liability on the part of either party.

BID FORM

Bidder's Proposal
Elizabethtown Freeman Lake Park
Shelters Project

Proposal of _____ (hereinafter called "BIDDER"), organized and existing under the laws of the State of _____, doing business as _____, to the City of Elizabethtown, Kentucky (hereinafter called "CITY").

In compliance with the Bidding Documents, BIDDER hereby proposes to furnish all equipment, materials, and labor for the Work required for the Elizabethtown Freeman Lake Park Shelters Project in strict accordance with the Contract Documents, within the time set forth herein as follows:

Base Bid $_____

The above price shall include all labor, materials, construction staking, overhead, profit, insurance and other items necessary to complete the finished Work. Changes shall be processed in accordance with the General Conditions.

BIDDER hereby proposes to commence the WORK under this Contract starting on the date of the executed Contract and to achieve Substantial Completion of the Project within the number of calendar days as follows:

_____(____) Calendar Days after date established by the executed Contract.

and to achieve Final Completion of the Project within thirty (30) calendar days after the date established for Substantial Completion. BIDDER further agrees to pay liquidated damages, as provided for by the General Conditions, and as specified in the Contract.

Accompanying this Proposal is a certified check or standard Bid Bond in the sum of $ _____, five (5) percent of the Base Bid amount. The BIDDER, by submittal of this Bid, agrees with the CITY that the amount of the Bid security deposited with this Bid fairly and reasonably represents the amount of damages the CITY will suffer due to the failure of the BIDDER to successfully secure and enter into the Contract.

BIDDER acknowledges receipt of the following Addenda:

_____

BIDDER agrees that the CITY reserves the right to delete the whole or any part of the Project from the Contract.

BIDDER understands that the CITY reserves the right to reject any and all Bids and to waive any informalities in the Bidding.

BIDDER agrees that this Bid shall be good and may not be withdrawn for a period of ninety (90) calendar days after the actual date of Bid opening.

Within fourteen (14) calendar days after receiving written notice of the acceptance of this Bid by the CITY, the BIDDER will execute and deliver to the CITY three (3) copies of the CONTRACT and such other required Contract Documents.

BIDDER:

_____

Signed By: _____

Title: _____

Address: _____

_____

Phone: _____

Fax: _____

Email: _____

Date: _____

BIDDER'S QUALIFICATIONS

A. The required names and addresses of all persons interested in the foregoing Bid, as Principals, are as follows:

_____

_____

_____

_____

_____

_____

B. Permanent place of business maintained at: _____

_____

C. List of references of work of a similar character to that included in the proposed Contract and references to enable the CITY to judge the BIDDER's experience, skill, and business standing are as follows:

_____

_____

_____

_____

_____

_____

_____

_____

_____

(Add supplementary pages if necessary)

UNIT PRICES

Unit prices shall include the furnishing and installation of all labor, materials, supplies, services and shall include all items of cost, overhead and profit for the Contractor and any Subcontractor involved, and shall be used uniformly without modification for either additions or deductions. The Unit Prices as established may be used to determine the equitable adjustment of the Contract Price in connection with changes or extra work performed under the Contract. Unit prices must be submitted with the Proposal.

1	4” Thick Concrete Sidewalk and Base	$	SY
2	Trench Excavation, Bedding and Backfill In-Place	$	LF
3			
4			
5			
6			
7			
8			
9			
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12			
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21			
22			

PROPOSED SUBCONTRACTORS

The BIDDER shall provide a list of the proposed Subcontractors for the branch of work as listed below. The list of Subcontractors is subject to approval from the CITY. The BIDDER shall not change any subcontractors listed below without approval from the CITY. The Form shall be filled out completely. All work that is to be performed by the BIDDER shall be marked as "Prime Contractor." Subcontractor List to be provided to CITY within 48 hours of Bid Opening.

Branch of Work	**Name and Address of Subcontractor**
Specialty Structure	
Building Foundation Concrete	
Masonry	
Plumbing	
Electric	
Joint Sealants	
Door Hardware	
Painting	
Site Concrete Paving	

End

PROPOSED MATERIAL / SUPPLIERS / FABRICATORS

The BIDDER shall provide a list of the proposed Materials / Suppliers / Fabricator for the products listed below. The list of Materials / Suppliers / Fabricators is subject to approval from the CITY. The BIDDER shall not change any material / supplier / fabricator listed below without approval from the CITY. The Form shall be filled out completely. Material / Supplier / Fabricator List to be provided to CITY within 48 hours of Bid Opening

Material	**Material / Supplier / Fabricator Name and Address**
Ready-Mixed Concrete	
Concrete Masonry	
Metal Roofing	
Door Hardware - Locksets	
Gypsum Board	
Storm Drainage Piping	
Interior Paint	
Toilet Compartments	
Toilet Accessories	
Specialty Structure	
Plumbing Specialties	
Light Fixtures	

End

BID BREAKOUT FORM

Provide breakout pricing for items listed below for the CITY construction prioritization. These prices shall include all work the BIDDER deems necessary to complete the work listed. The CITY will NOT use this list to remove work from the CONTRACT. Removal of work from the CONTRACT shall be by unit prices or other agreed method. Sum of all items should total the amount bid by Contractor. Bid Breakout Form to be provided to CITY within 48 hours of Bid Opening.

ITEM	AMOUNT
A. Restroom / Shelter Building	$ _____
B. Restroom Building	$ _____
PROJECT TOTAL:	$_____

NOTICE OF AWARD

TO: _____
_____
_____

Project Description: Elizabethtown Freeman Lake Park
Shelters Project
Elizabethtown, Kentucky

The City of Elizabethtown has considered the bid submitted by you for the above-described work in response to its Advertisement for Bids dated _____.

You are hereby notified that your bid has been accepted for constructing this Project in the amount of _____.

You are required by the Instructions to Bidders to execute the Contract and furnish the required Contractor's Certificates of Insurance, and business license within fourteen (14) calendar days from the date of this notice to you.

If you fail to execute said Contract and to furnish said documents within fourteen (14) days from the date of this Notice, the City will be entitled to consider all your rights arising out of the City's acceptance of your bid as forfeited. The City will be entitled to such other rights as granted by law.

You are required to return an acknowledged copy of this Notice of Award to the City of Elizabethtown, Attention: Jason Dailey, 200 West Dixie Avenue, Elizabethtown, KY 42701.

Dated this _____ day of _____, 202_.

CITY OF ELIZABETHTOWN, KENTUCKY

By:_____

Title: _____

ACCEPTANCE OF NOTICE

Receipt of the above Notice of Award is hereby acknowledged by _____, this the _____ day of _____, 2024.

By:_____

Title: _____

CONTRACT

THIS AGREEMENT, made this ___ day of _____, 202_, by and between the CITY OF ELIZABETHTOWN, KENTUCKY, herein after called "CITY" and _____, doing business as (a corporation, a partnership, or an individual as applicable), hereinafter called "CONTRACTOR".

WITNESSETH: That for and in consideration of the payment and agreements hereinafter mentioned:

The CONTRACTOR shall commence and complete the Elizabethtown Freeman Lake Park Shelters Project in Elizabethtown, Kentucky, according to the Contract Documents associated with this Project.

The CONTRACTOR shall furnish all of the materials, supplies, tools, equipment, labor, and other services necessary for the completion of the Project described herein, in the manner and form as provided by the Contract Documents.

The CONTRACTOR shall commence the WORK required by the Contract Documents upon the date of this Contract. Unless the period for Substantial Completion and for Final Completion is extended otherwise by the Contract Documents, the date of Substantial Completion of the Project shall be as follows:

_____(date)
(____) Calendar Days after start date of Contract.

The date of Final Completion for the Project shall be within thirty (30) calendar days from the date of Substantial Completion of the Project.

Final Completion: _____(date)

The CONTRACTOR agrees to perform all of the WORK described in the Contract Documents and comply with the terms therein for the Sum of

($) _____as shown in the Bidder's Proposal.

The CONTRACTOR and CITY agree to the following Contract terms:

1.1 Contract Documents

A. The Advertisement for Bids, Instructions to Bidders, Bidder's Proposal, Addenda, Bid Bond, Notice of Award, Contract, Certificates of Insurance, Notice to Proceed, General Conditions, Change Orders, Waiver of Lien/Acknowledgement of Payment, Drawings, Technical Notes and Specifications shall all be binding on the Contractor, and shall be fully a part of the Contract as if thereto attached or therein repeated in words and figures.

B. The Contractor shall inform the City of any discrepancies between the Plans and Specifications for the Project. The City reserves the right to rectify the discrepancies in the best interest of City and the public served by the City.

2.1 Definitions

A. Whenever the word "City" is used, it shall be held to mean the City of Elizabethtown.

B. The term "Contractor" shall mean that person, firm or corporation with whom an official contract is made by the City. Legal responsibility for all transactions shall rest with the "Contractor" whether the work to be performed with its own forces and/or by subcontractors of the "Contractor".

C. The term "Subcontractor" as employed herein, includes only those having a direct contract with the Contractor, and it includes those providing materials and labor at the site.

D. The term "Written Notice" as employed herein, shall be deemed to have been duly served, if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at site or sent by registered mail to the last business address known to him who gives the notice. Acknowledgement of the receipt of all written notices shall be provided to the City by the Contractor.

E. The term "Work" includes labor or materials or both, equipment, transportation, or other facilities necessary to complete the Contract.

F. The term "Provide" as used throughout the specifications, shall mean furnish and install and pay for.

3.1 Indemnification

A. The Contractor, its successor or assigns, agrees to indemnify and hold harmless the City, its agents and employees for any and all claims, damages, losses and expenses which may arise as a result of the work performed under this Contract. The Contractor, its successors or assigns, shall be responsible for any and all costs or awards of damages associated with any claim for injury of any kind arising out of the work performed under this Contract. The Contractor, its successors or assigns, will be responsible for any attorney’s fees and costs incurred by the City in the defense of any claim.

4.1 Insurance

A. The Contractor will not be permitted to commence work until all insurance required by the documents is obtained and such insurance has been approved by the City, nor shall the Contractor allow any Subcontractor to commence work until all insurance required has been obtained and approved.

B. Each policy of insurance covering the Contractor's operations under the Contract shall provide that such policy cannot be altered or cancelled in less than thirty (30) days after the mailing of written notice of such alteration or cancellation to the City or not less than five (5) days after actual receipt by the City, of written notice of such pending alteration or cancellation.

C. Certificates of Insurance coverage shall include a statement of alteration or cancellation provisions of the policy, sufficient to show definitely that such provisions comply with the requirements stated herein.

D. The Contractor shall take out and maintain during the life of this Contract, Workmen's Compensation Insurance, as required by Statute, for all of its employees employed at the Project site, and in case any work is sublet, for all the subcontractor's employees not otherwise insured. In case any class of employees engaged in hazardous work under this Contract at the Project site is not protected under the Workmen's Compensation Statute, the Contractor shall provide adequate coverage for the protection of the Employees not otherwise protected.

E. The Contractor shall take out and maintain during the life of this Contract such Comprehensive General Liability (Bodily Injury and Property Damage) Insurance as shall protect him and any Subcontractor performing work covered by the Contract from claims for damages because of personal injury, including accidental death, and from claims for property damages, which may arise from operations under this Contract, whether such operation be by him or by any Subcontractor, or by anyone directly or indirectly employed by either of them. The policy shall name as the insured the Contractor and the City.

F. The Contractor shall provide Builder's Risk Insurance (fire and extensive coverage) on all work in place and/or materials at the site where there is any considerable risk from such causes for damage. Such insurance shall provide coverage as set forth by the minimum insurance limits required. The policy shall name as the insured the Contractor, and the City.

G. The minimum amounts of insurance to be furnished by and for the Contractor and the Subcontractors, and for the City as a named insured, under this

Contract are:

1. Workmen's Compensation — Applicable State Statutes
   Employer's Liability

2. Comprehensive General Liability
   Bodily Injury Liability &
   Property Damage Liability -
   Combined Single Limit — $1,000,000 each occurrence

   Property Damage Liability — $2,000,000 general aggregate

   Comprehensive Automobile Liability
   Bodily Injury Liability
   Property Damage Liability,
   Combined Single Limit — $1,000,000 each accident

3. Builder's Risk Insurance: To include coverage for 100% of the insurable value of materials and accessories to be used in conjunction with the work for losses due to Fire, Explosion, Hail, Lightning, Vandalism, Malicious Mischief, Wind, Collapse, Riot, Aircraft, Smoke, Transportation and Extended Coverage for the benefit of the City, Contractor, and the Subcontractors as their interests may appear during the Contract Time and until the work is accepted by the City.

4. Additional insureds: City of Elizabethtown

5. The City shall not be obligated however to review such insurance certificates, policies and endorsements, or to advise the Contractor of any deficiencies in such documents, and such receipt shall not relieve the Contractor from or be deemed a waiver of the City's right to insist on strict fulfillment of the Contractor's obligations herein

6. For payment of materials stored offsite above $5,000.00, proof of insurance and photos must accompany payment requests.

5.1 Surety Requirements

A. The Contractor shall maintain a Performance Bond and a Payment Bond as an essential part of this Contract. The Bonds shall be provided for the length of the Project.

B. The Performance Bond and Payment Bond forms shall be provided by the City and made a part of this Contract.

C. In lieu of the Performance and Payment Bond, the City will also accept an

Irrevocable Letter of Credit from a FDIC insured bank in the full amount of the Contract. The term of the Letter of Credit shall be for the length of the Contract plus an additional one (1) year for warranty on all work performed. The Letter of Credit shall require a City signature to reduce or close the Letter of Credit

6.1 Authority to Act

A. The City shall assign personnel that have the right to modify, change, terminate, suspend, or sign any portion of the Contract. Changes made by other personnel shall not be binding to this Contract and the Contractor shall indemnify the City from any changes that are not approved by the appropriate personnel for this Contract.

B. The assigned City Personnel for this Project shall be Jason Daily, Seth Breitner, Kerray Wooton, and/or their supervisors including the Mayor of Elizabethtown. CMW Inc has been hired by the City to act as the City's design consultant.

7.1 Notices

A. All notices for this Contract shall be made in writing. No verbal directives or changes shall be held enforceable. It is the Contractor's responsibility to ensure that all directives and changes are in writing prior to commencing work on the directives or changes.

B. The use of electronic notifications is acceptable, but shall be followed in writing for official directives or changes.

C. Any questions concerning the Contract, Plans, Specifications or other supplemental information shall be made on an official Request for Information (RFI) form that is provided as part of the specifications for this Contract. It is the Contractor's sole responsibility to keep a log of all Request for Information forms.

D. An official Request for Proposal (RFP) form shall be used for the City to obtain pricing on potential changes from the Contractor. Request for Proposal's shall not be viewed as an official Authority to Act on said potential changes and no additional compensation shall be awarded to the Contractor if Work is commenced on a Request for Proposal. An official Change Order is the only document that allows additional compensation for Changes in Work to the Contract. It is the General Contractor's sole responsibility to keep a log of all Request for Proposal forms.

E. An official Change Order form shall be completed and signed prior to Work being commenced on the change to the Contract. The official Change Order

form provided in the specifications shall be used for all changes to the Contract.

8.1 Commencement and Completion of Work

A. The Contractor shall commence work by the date specified in the Notice to Proceed and shall achieve Substantial Completion of the Project within the number of days set out in the Contract, and shall achieve Final Completion of the Project under the Contract within the number of days set out in the Contract.

B. For this Project, Substantial Completion of the Project is the time when the Work of the Project is complete in accordance with the Contract Documents and has all applicable approvals from authorities having jurisdiction, that allows the Owner to occupy and utilize the Work for its intended use. Occupancy of the Project shall not constitute acceptance of work not complying with the requirements of the Contract Documents.

C. For this Project, Final Completion of the Project is the time when the Work of the Project has been completed and the Contract fully performed, and the Contractor's final application for payment has been approved.

D. As set forth in the Contract as stipulated in Article 14.1, Substantial Completion of the work of the Project and Final Completion of the Project shall be subject to liquidated damages.

9.1 Contractor's Obligations

A. The Contractor shall perform all work in a good workmanship like manner, and furnish all supplies and materials, machinery, equipment, facilities, and means, to perform and complete all the work required by this Contract according to the plan, specifications, regulations, manufacturer's requirements and standards of practice, within the time herein specified. The Contractor shall furnish, erect, maintain, and remove at the completion of the Contract, all temporary plant as may be required during the construction period.

B. The Contractor shall keep on site, during work progress, a competent supervisor and any necessary assistants, all satisfactory to the City. The supervisor shall not be changed except with the consent of the City unless the supervisor proves to be unsatisfactory to the Contractor and ceases to be in his employment. The supervisor shall represent the Contractor in his absence and all directions given to him shall be as binding as if given to the Contractor. Other directions shall be confirmed on written request in each case. The Contractor shall give sufficient supervision to the work, using his best skill and attention. If the Contractor, in the course of the work, finds any

discrepancy between the drawings and the physical conditions of the locality or any errors or omissions in the drawings or in the layout as given by points and instruction, it shall be his duty to immediately inform the City, in writing, and the City shall promptly verify same. Any work done after such discovery, until authorized, will be done at the Contractor's risk.

C. The Contractor shall be responsible for all lines, levels and measurements of all work executed under his Contract. The Contractor shall verify the figures before laying out the work and will be held responsible for any error resulting from his failure to do so. The Contractor shall be prepared to guarantee to each of the subcontractors the dimensions they may require for the layout and fitting of their work to the surrounding work. It shall be the duty of the Contractor to keep his job policed and clean at all times. Rubbish and trash shall be cleaned out and removed daily and the premises kept in conditions satisfactory to the City.

D. The Contractor providing materials and equipment shall be responsible for the proper and adequate storage of their materials and equipment.

E. All branches of work shall be executed in strict compliance with all state and federal regulations and codes, and shall be in compliance with all national codes when same have jurisdiction. Reference to standards, codes, specifications, and regulations; refer to the latest edition of printing in effect at the date of issue shown in the document, unless another date is implied by the suffix number of the standard.

F. The Contractor and all employed workmen shall conduct all operations in a clean and sanitary manner. The workmen shall use proper waste receptacles and leave the site whenever necessity arises. Portable toilet facilities shall be available from beginning day of work until work is completed, unless other sanitary arrangements are approved by the City.

G. The Contractor shall safeguard all necessary Stormwater protection requirements. The requirements shall be provided per the requirements of the Project’s Approved Erosion Prevention and Sediment Control permit obtained from the City of Elizabethtown’s Stormwater Department.

10.1 General Contract Warranty

A. Neither the final certificate nor payment nor any provisions in the Contract Documents shall relieve the Contractor of responsibility for faulty materials, or workmanship and, unless otherwise specified, the Contractor shall remedy any defects due thereto and pay any damage to other work resulting there from, which shall appear within a period of one (1) years from the date of Final acceptance of the Work by the City. The City shall give notice of

observed defects with reasonable promptness. All questions arising under this article shall be subject to the provisions of the Dispute Resolution Clause of this Contract.

11.1 Safety

A. The Contractor shall take all necessary precautions and provide all necessary safeguards to prevent personal injury and property damage. The Contractor shall provide protection for all persons including, but not limited to his employees and employees of other contractors or subcontractors; members of the public; and employees, agents, and representatives of the City and regulatory agencies that may be on or about the Work. The Contractor shall provide protection for all public and private property including, but not limited to, structures, pipes, and utilities, above and below ground.

B. The Contractor shall provide and maintain all necessary safety equipment such as fences, barriers, signs, lights, walkways, guards and fire protection and shall take such other action as required to fulfill his obligation under this subsection.

C. The Contractor shall comply with all Federal, State and City requirements for confined space entry. Notice is hereby given that the Contractor shall adhere to the City's Confined Space Entry Program.

D. The Contractor shall indemnify and hold harmless the City and all City personnel from any and all safety issues, damages, or fines that may arise on the Project.

E. The Contractor shall provide to the City a written safety plan for the Project. This plan shall include all required personal protection equipment that is to be worn on the Project site. All persons entering the Project site shall follow the written safety plan for the Project.

F. The Contractor shall follow all required sections of the Kentucky OSHA Standards for the Construction Industry, Latest Edition, as base minimums for the safety on the Project site.

11.2 Equal Employment Opportunity

A. Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to race, color, religion, sex, or national origin. Contractor agrees to post in

conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

B. Contractor will cause the foregoing provisions to be inserted in all subcontracts for any work covered by this Contract so that such provisions will be binding upon each subcontractor, provided that the foregoing provisions shall apply to contracts or subcontracts of Contractor not relating to any work or services to the City.

12.1 Payment

A. Payment to the Contractor will be made either in one (1) lump sum after the job has been completed and accepted by the City, or the Contractor may apply monthly for partial payment at various stages of construction.

B. An amount equal to five percent (5%) of the value of the Work completed will be retained by the City from each partial payment to secure completion of the Work. Final payment is contingent upon the Work being satisfactorily performed in complete accordance with the Contract.

C. The Contractor shall certify to the City that all bills for materials have been paid and that all subcontractors have been compensated for services. The following forms shall be signed and submitted before final payment is authorized: Contractor's Affidavit & Waiver of Lien and Subcontractor's Affidavit & Waiver of Lien.

D. Final payment to the Contractor shall be made within thirty (30) days of acceptance of all work by the City and submission by Contractor of Affidavit & Waiver of Lien/Acknowledgement of Payment Affidavit.

13.1 Changes

A. The City reserves the right to make changes to the Contract. The City shall notify the Contractor in writing of any changes in the contracted work.

B. Any alterations or modifications of the Work contracted for shall be made only by written agreement or change order between the City and the Contractor before any such alterations or modifications have begun. All changes shall only be administered on the official change order form as specified here within.

14.1 Liquidated Damages

A. It is mutually agreed between the parties hereto that time is of the essence in this Contract, such that in the event the completion of the Work does not achieve Substantial Completion within the time herein specified, including any extension of time granted under the Contract, that the City may retain

from the compensation otherwise to be paid to the Contractor, the sum of five-hundred ($500.00) dollars per calendar day for each calendar day of delay thereafter, Sundays and holidays included, for the time that the Work fails to attain Substantial Completion of the Project. This sum shall increase to one thousand ($1,000.00) dollars per calendar day for each calendar day of delay thereafter, Sundays and holidays included, and including any extension of time granted under the Contract, for the time the Work fails to attain Final Completion of the Project.

B. Liquidated Damages shall be waived for and during extent of delay caused By Contractor's inability to obtain material or equipment by reasons such as Federal embargoes, priority orders, or other restrictions imposed by the United States Government, provided that adequate evidence is presented by the Contractor to substantiate such delay and to enable the Owner to determine with exactness the extent and duration of such delay for each item of material and equipment involved.

C. The Contractor shall be responsible for any claims made by the Architect/Engineer to the City, in an amount not to exceed two hundred ($200.00) dollars per hour for the time charged by the Architect/Engineer, due to deficient work or delays caused by the Contractor in completing the Project as agreed. This provision shall be in addition to the Liquidated Damages Clause above. The Architect/Engineer will provide documentation to the City to demonstrate that that additional time, including site visits, is required beyond any agreed contractual task and site visit.

15.1 Inspection of Work

A. The Work shall at all times be subject to inspection but such inspection shall not relieve the Contractor from any obligation to perform said Work in accordance with the technical notes thereof, as herein provided, and Work not done strictly in accordance with the Contract Documents shall be corrected and made good by the Contractor whenever so ordered by the City, without reference to any previous oversight or error in inspection.

16.1 Right to Terminate Contract for City's Convenience

A. The City may terminate the Contract for its own convenience when it is determined that such termination will be in the best interest of the City of Elizabethtown. When it has been determined that a Contract should be terminated for the convenience of the City, the Contractor shall be compensated for all Work completed to that date.

B. The Contractor shall have the burden of establishing the amount of compensation to which he believes himself to be entitled by the submission

of completed and accurate cost data employed in submitting his bid or proposal for the Contract, and evidence of expenses paid or incurred in performance of the Contract from the date of award through the date of termination for convenience. A fair and just settlement shall be negotiated if necessary and all settlements shall be subject to the Dispute Resolution clause of this Contract.

17.1 Right to Suspend Contract for City's Convenience

A. The City reserves the right to suspend the Contract and halt all work for its own convenience when it is determined that the suspension will be in the best interest of the City of Elizabethtown.

B. The City shall notify the Contractor on the number of days the Contract is suspended for and shall execute a Change Order to extend the Contract the number of days the Contract is suspended.

C. The Contractor shall have the burden of establishing an amount of compensation to which he believes himself to be entitled due to the suspended Contract. A fair and just settlement shall be negotiated if necessary and all settlements shall be subject to the Dispute Resolution clause of this Contract.

18.1 Delays

A. The Contractor shall be responsible for the Project being completed in a timely manner. The City shall reserve the right to reject any and all claims of delay.

B. The Contractor has the sole responsibility to track and log any and all delays. The Contractor shall provide a request for extension within two weeks of the delay. Any and all claims made after the two-week period shall be rejected.

C. All time delays encountered during the construction process caused by adverse weather conditions shall be determined utilizing the following methodology. The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the Project location and will constitute the base line for monthly weather time evaluations. The Contractor's progress schedule must reflect these anticipated weather delays in all-weather dependent activities.

Monthly Anticipated Adverse Weather Delay

Work Days Based on 5 Work Days per Week

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
11	8	6	6	5	4	5	4	4	4	4	6

Upon acknowledgement of the Contract and continuing throughout the Contract allotted time, the Contractor will record on the daily report, the occurrence of adverse weather and resultant impact to the normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent more the Contractor's scheduled work day. The number of actual adverse weather delay days shall include days impacted by actual adverse weather, be calculated chronologically for the first to last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated by in the chart above, the City will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with this Contract.

19.1 Dispute Resolution

A. Any disputes which may arise shall first be addressed by a mediator who shall be mutually agreed upon and retained by the parties. The parties shall equally divide any fees and costs for said mediation. If said dispute cannot be resolved through mediation, then the parties may proceed to the court having the appropriate jurisdiction to seek any necessary relief.

20.1 Equipment and Materials

A. The use of second hand and/or salvaged materials will not be permitted unless specifically provided for in the specifications. Equipment shall be new when turned over to the City. Equipment shall be delivered to the job site in factory sealed containers which list the manufacturer's name, model number, and identification number.

B. All equipment to be removed from existing structures and not specifically to be re-used shall remain the property of the City. Such equipment shall be stored on site or disposed of by the Contractor as directed by the City.

21.1 Subcontractors

A. The Contractor shall provide a list of all subcontractors, material suppliers and consultants that will be utilized to complete the Project. This list shall be submitted for review with the bidding documents. The subcontractors cannot be changed unless permission from the City is obtained.

22.1 Governance

A. The Contract and obligations hereunder shall be governed in all respects by

the laws of the Commonwealth of Kentucky.

B. This CONTRACT shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

IN WITNESS WHEREOF, the parties hereto have executed or caused to be executed by their duly authorized officials, this CONTRACT in three (3) copies each of which shall be deemed an original on the date first written above.

(SEAL)

CITY OF ELIZABETHTOWN, KENTUCKY

ATTEST: _____

By: _____

Name: _____
(Please Type)

Name: _____
(Please Type)

Title: _____

Title: _____

(SEAL)

CONTRACTOR:

_____

ATTEST: _____

By: _____

Name: _____
(Please Type)

Name: _____
(Please Type)

Title: _____

Title:_____

PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____, hereinafter called
(Corporation, Partnership, or Individual)

CONTRACTOR, and

_____
(Name of Surety)

_____
(Address of Surety)

hereinafter called SURETY, are held and firmly bound onto the CITY OF ELIZABETHTOWN, KENTUCKY (Name of Owner)

200 West Dixie Avenue, P.O. Box 550, Elizabethtown, Kentucky 42701
(Address of Owner)

hereinafter called CITY, in the total aggregate penal sum of_____
_____Dollars ($_____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the CONTRACTOR entered into a certain CONTRACT with the CITY, dated the _____ day of _____, 202_, a copy of which is hereto attached and made a part hereof for the:

Elizabethtown Freeman Lake Park
Shelters Project
Elizabethtown, Kentucky

NOW, THEREFORE, that the CONTRACTOR shall well, truly, and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said CONTRACT during the original term thereof, and any extensions thereof, which may be granted by the CITY with or without notice to the SURETY and during the one year

guaranty period, and that the CONTRACTOR shall satisfy all claims and demands that are incurred under such CONTRACT, and shall fully indemnify and save harmless the CITY from all costs and damages which it may suffer by reason of failure of CONTRACTOR to do so, and shall reimburse and repay the CITY all outlay expense which the CITY may incur in making good any default within 90 days of Notice by CITY. This obligation shall remain in effect until one year from final acceptance by CITY.

PROVIDED, FURTHER, that the said SURETY, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the CONTRACT to be performed thereunder or the TECHNICAL NOTES accompanying the same shall in any way affect its obligation to this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the TECHNICAL NOTES.

PROVIDED, FURTHER, that it is expressly agreed that the BOND shall be deemed amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the CONTRACT not increasing the contract price more than 20 percent, so as to bind the CONTRACTOR and the SURETY to the full and faithful performance of the CONTRACT as so amended. The term "Amendment", whenever used in this BOND, and whether referring to this BOND, the CONTRACT or the CONTRACT DOCUMENTS shall include any alteration, addition, extension, or modification of any character whatsoever.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of which shall be deemed an original, this the _____ day of _____, 202_.

_____
CONTRACTOR

ATTEST:

_____
Contractor Secretary

By:_____

Address:_____

(SEAL)

_____

_____
Witness to Contractor

Address: _____

_____

ATTEST:

_____
Witness to SURETY

Address:_____

_____

_____
SURETY

By:_____
Attorney in Fact

Address:_____

PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____, hereinafter called CONTRACTOR
(Corporation, Partnership, or Individual)

and

_____
(Name of Surety)

hereinafter called SURETY, are held and firmly bound onto

THE CITY OF ELIZABETHTOWN, KENTUCKY
200 WEST DIXIE AVENUE, P.O. Box 550, Elizabethtown, Kentucky 42701

hereinafter called CITY, and unto all persons, firms, and corporations who or which may furnish labor, or who furnish materials to perform as described under the CONTRACT and to their successors and assigns in the total aggregate penal sum of
_____ Dollars

($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly to these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the CONTRACTOR entered into a certain CONTRACT with the CITY dated the _____ day of _____, 202_, a copy of which is hereto attached and made a part hereof for the:

Elizabethtown Freeman Lake Park
Shelters Project
Elizabethtown, Kentucky

NOW THEREFORE, that the CONTRACTOR shall promptly make payment to all persons, firms, and corporations furnishing materials for or performing labor in the prosecution of the WORK provided for in such CONTRACT, and any authorized extensions or modifications thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and for all labor cost incurred in such WORK including that by a SUBCONTRACTOR, and to any mechanic or materialman lienholder whether it acquires its lien by operation of State or Federal law; then this obligation shall then be void,

otherwise to remain in full force and effect.

PROVIDED, that beneficiaries or claimants hereunder shall be limited to the SUBCONTRACTORS, and persons, firms, and corporations having a direct contract with the CONTRACTOR or its SUBCONTRACTORS, in addition to the CITY.

PROVIDED, FURTHER, that the said SURETY for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the CONTRACT or to the WORK to be performed thereunder or the TECHNICAL NOTES accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of this contract or to the WORK or to the TECHNICAL NOTES.

PROVIDED, FURTHER, that no suit or action shall be commenced hereunder by any claimant except CITY: (a) Unless claimant other than one having a direct contract with the CONTRACTOR, shall have given written notice to any two of the following: The CONTRACTOR, the CITY, or to the SURETY above named within one hundred eighty (180) days after such claimant did or performed the last of the WORK or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the WORK or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the CONTRACTOR, CITY, or SURETY, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid Project is located, save that such service need not be made by a public officer; (b) After the expiration of eighteen (18) months following the date of which CONTRACTOR ceased WORK on said CONTRACT, it being understood, however, that if any limitation embodied in the BOND is prohibited by any law controlling the construction hereof, such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

PROVIDED, FURTHER, that it is expressly agreed that this BOND shall be deemed amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the CONTRACT not increasing the contract price more than 20 percent, so as to bind the CONTRACTOR and the SURETY to the full and faithful performance of the CONTRACTOR as so amended. The term "Amendment", whenever used in this BOND and whether referring to this BOND, the CONTRACT or the CONTRACT DOCUMENTS shall include any alteration, addition, extension or modification of any character whatsoever.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of which shall be deemed an original, this the ____ day of _____, 202_.

_____
CONTRACTOR

ATTEST:

_____ Address:_____
Contractor Secretary

_____

(SEAL)

_____
Witness to Contractor

Address_____

_____
ATTEST: SURETY

_____ By:_____
Witness to SURETY Attorney in Fact

Address:_____ Address:_____

_____ _____

NOTICE TO PROCEED

For
Elizabethtown Freeman Lake Park
Shelters Project
Elizabethtown, Kentucky

TO: _____ DATE: _____

_____

_____

According to the Contract that was signed _____, the official start date for this Project is _____. The date for Substantial Completion of the Project shall be:

_____(date)
(____) Calendar Days after start date of Contract.

The date of Final Completion for the Project shall be within thirty (30) calendar days from the date of Substantial Completion of the Project.

Final Completion: _____(date)

CITY OF ELIZABETHTOWN

By: _____

Title: _____

CONTRACTOR ACCEPTANCE OF NOTICE TO PROCEED

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by

_____ this the _____ day of

_____, 202_.

By: _____

Title: _____

REQUEST FOR INFORMATION

RFI No.: _____ RFP No.: _____

Project Name: _____

Contractor: _____

Name: _____

Specification Number/Drawing Number: _____

Date Information Requested: _____ Date Response Needed: _____

DESCRIPTION OF INFORMATION REQUIRED:

RESPONSE:

Proposal

☐ No Change in Cost or Time

☐ Decrease in Cost $_____ ☐ Decrease in Time of _____ days

☐ Increase in Cost $_____ ☐ Increase in Time of _____ days

Owner Receipt Date:_____

Design Consultant (Agent) Receipt Date:_____

Contractor Receipt Date: _____

CHANGE ORDER

Date: _____ Number: _____

Project:

Design Consultant (Agent):

Contractor:

You are directed to make the following changes in the Contract Documents:

Description\Purpose:

Change Order Cost (Credit):

Change in Contract Time: _____

RECOMMENDED BY: _____
Design Consultant (Agent)

APPROVED and AUTHORIZED BY: _____
Authorized City Official

AGREED BY: _____
Contractor

CONTRACTOR'S AFFIDAVIT AND WAIVER OF LIEN
ACKNOWLEDGEMENT OF PAYMENT

_____, CONTRACTOR, having a Contract with the CITY OF ELIZABETHTOWN, KENTUCKY on the Elizabethtown Freeman Lake Park Shelters Project, dated _____, 202_, has performed WORK and/or furnished materials, equipment and/or machinery or has fabricated materials especially for the Project, during the period from _____ to _____.

For and in consideration of $_____, being the total of payments hereby acknowledged, _____, CONTRACTOR, certifies that the cost and expense for all labor, payroll taxes, materials, equipment and/or machinery including but not limited to, all amounts owed to all subcontractors and providers of materials, incurred on or before_____, for the Elizabethtown Freeman Lake Park Shelters Project, have been paid in full.

_____, CONTRACTOR, hereby certifies that with this payment all monies due said CONTRACTOR have been paid in full to date.

_____, CONTRACTOR, hereby waives and releases all rights to liens and claims against the CITY and any surety for the payment of his CONTRACT from its inception through _____, and further states that no other person has any right to a lien or claim against the CITY on account of WORK performed or for material, equipment, and/or machinery, or for materials especially fabricated for the Project.

_____ (name), being _____ (title) of _____ (Contractor) hereby acknowledges the foregoing in full and certifies that this is a true and accurate statement.

CONTRACTOR

BY: _____

TITLE: _____

STATE OF KENTUCKY
COUNTY OF HARDIN

SUBSCRIBED, SWORN TO AND ACKNOWLEDGED before me by _____ of _____, on this the _____ day of _____, 202_.

_____
Notary Public
My Commission Expires:_____

SUBCONTRACTOR'S AFFIDAVIT AND WAIVER OF LIEN
ACKNOWLEDGEMENT OF PAYMENT

_____, subcontractor, has performed work and/or furnished materials, equipment and/or machinery or has fabricated materials especially for the Elizabethtown Freeman Lake Park Shelters Project, during the period from _____ to _____.

_____, subcontractor does hereby certify that it have been paid in full for all said materials, equipment or services.

For and in consideration of $_____, being the total amount due, _____, subcontractor, hereby releases and waives all rights to assert any claim or lien against the City of Elizabethtown, Kentucky, and any surety. The undersigned further states that he or she knows of no other person, firm or corporation that has any right to any claim or lien against the City of Elizabethtown, Kentucky, due to work performed or material, equipment and/or machinery supplied concerning this Project.

_____ (name), being _____ (title) of _____ (subcontractor), hereby acknowledges the foregoing in full and certifies that this is a true and accurate statement.

SUBCONTRACTOR

BY: _____

TITLE: _____

STATE OF KENTUCKY
COUNTY OF HARDIN

SUBSCRIBED, SWORN TO AND ACKNOWLEDGED before me by _____ of _____, on this the _____ day of _____, 202_.

_____
NOTARY PUBLIC

My Commission Expires: _____

003119 - EXISTING CONDITIONS INFORMATION

1.1 EXISTING CONDITIONS INFORMATION

A. This Document with its referenced Drawing is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. They are made available for Bidders' convenience and information but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents

B. Existing Conditions Plan Sheet C-001 prepared by CMW is available for viewing as part of the Drawings.

1. Information on this existing conditions plan represents the final design of the Elizabethtown Freeman Lake Park - South End Improvements project currently under construction. If the contractor does not accept the information as shown on this plan, without exception, they shall have made, at their own expense, a survey by a registered land surveyor for review by the owner and CMW. The contractor must field verify the existing information prior to construction. No adjustment for incorrect information will be made after the start of construction.

C. Related Requirements:

1. Document 003132 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.

END OF DOCUMENT 003119

003132 - GEOTECHNICAL DATA

1.1 GEOTECHNICAL DATA

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents. However, recommendations of the geotechnical study are hereby incorporated as minimum standards for this Project except as modified by the requirements of this Project Manual.

B. A geotechnical investigation report, including soil-boring data, obtained for Project, prepared by ECS Southeast, LLP (ECS), 1762 Watterson Trail, Louisville, KY 40299, Telephone 502-493-7100, dated October 21, 2022, is available for viewing as appended to this Document in Document 003132A.

C. Related Requirements:

1. 003119 "Existing Condition Information" for information about existing conditions that is made available to bidders.

END OF DOCUMENT 003132

ECS Southeast, LLP

Geotechnical Engineering Report

Freeman Lake Park - City of Elizabethtown

212 Freeman Lake Park Rd,
Elizabethtown, Hardin County, Kentucky 42701

ECS Project Number 61:2851

October 21, 2022

October 21, 2022

City of Elizabethtown, Kentucky
c/o CMW Architects & Engineers
249 East Main Street, Suite 100
Lexington, Kentucky 40507

Attention: Mr. Brad Boaz, PLA, LEED GA, MBA

ECS Project No. 61:2851

Reference: Geotechnical Engineering Report
Freeman Lake Park - City of Elizabethtown
212 Freeman Lake Park Rd,
Elizabethtown, Hardin County, Kentucky 42701

Dear Mr. Boaz:

ECS Southeast, LLP (ECS) has completed the subsurface exploration and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with ECS Proposal No. 61:P2845, dated August 18, 2022.

This report presents our understanding of the geotechnical aspects of the project along with the results of the field exploration, laboratory testing conducted, and our geotechnical related design and construction recommendations.

It has been our pleasure to be of service to CMW Architects & Engineers and City of Elizabethtown during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase and would like to provide our services during construction operations as well to confirm the interpreted subsurface conditions utilized in this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact the writers.

Respectfully submitted,

ECS Southeast, LLP

Bashir Hasanzadeh, Ph.D.
Project Engineer
Bhasanzadeh@ecslimited.com

Liz Newcomb, P.E.
Principal Engineer
Lnewcomb@ecslimited.com

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Appendix

- Site Location Diagram
- Boring Location Plan
- Soil & Rock Classification
- Boring Legend
- Boring Records
- Boring Composite
- Field Procedures
- Laboratory Procedures
- GBA “Important Information About Your Geotechnical Engineering Report”

EXECUTIVE SUMMARY

This Executive Summary presents as a very brief overview of the geotechnical conditions at this site that are expected to affect design and construction. The following conditions were characteristic of the encountered site and subsurface conditions:

- Planned construction consists of new tennis courts, a playground, an open-air shelter with restrooms, a separate restroom building, and associated access roads and parking areas.
- The proposed construction areas mainly consist of undeveloped land/landscaping areas and existing access roads. The site generally sloped down from northwest to east-southeast with a maximum elevation difference of approximately 26 feet across the proposed construction areas.
- Surface materials in our borings consisted of approximately 1 to 4 inches of topsoil in unpaved areas and 5 inches of asphalt followed by 13 inches of gravel in paved areas (Boring B-10).
- In nine (9) borings, surface materials were underlain by existing fill (possible fill) extending to approximately 1.8 to 6 feet below the existing grade. Existing fill consisted of brown, gray, gray brown, red brown, low to moderate plasticity, dry to moist, silty clay with trace to few organics and trace to mostly crushed stone. Fill was not encountered in Boring B-10.
- Surface materials and/or existing fill were underlain by native soils which generally consisted of brown, red brown, orange brown, low to moderate plasticity, soft to hard, slightly moist to very moist, silty LEAN CLAY (CL) with varying amounts of black oxide nodules and chert fragments. Lean clay extended to refusal or boring termination.
- Direct Push refusal was encountered in four (4) borings at 15.3 to 16.7 feet below existing grades. Refusal was not encountered in six (6) borings prior to boring termination at approximately 10.5 feet below existing grades.
- Groundwater was not encountered in any of the borings at the time of drilling.

GEOTECHNICAL CONCERNS:

- Existing Fill
- Existing Surfaces
- Karst
- Trees
- Degradable Soils
- Reuse of On-Site Soils
- Subgrade Improvement
- Weather Considerations

DESIGN & CONSTRUCTION RECOMMENDATIONS:

- The proposed buildings may be supported on conventional shallow foundations bearing on stiff or stronger undisturbed inorganic clay or structural fill as defined in this report. The following net allowable design bearing pressures may be used in foundation design:
  - 2,000 psf for continuous wall foundations.
  - 2,400 psf for isolated column foundations.
- Floors may be designed as slabs-on-grade with a subgrade modulus of 100 pci.
- A site class of “C” may be used in seismic design per the 2018 Kentucky Building Code.
- Foundation excavations and floor and pavement subgrades should be evaluated by an ECS representative during construction to confirm that encountered conditions are consistent with the findings of this exploration.

This summary should not be separated from the entire text of the report with the complete qualifications and considerations mentioned herein. Details of our conclusions and recommendations are discussed in the report text. Findings and recommendations in this report are based on an assumed finish floor elevation. As such, ECS should be contacted to provide appropriate values and recommendations for changes to the assumed elevations.

1.0 INTRODUCTION

1.1 GENERAL

The purpose of this report is to provide the results of our subsurface exploration, engineering analyses, and geotechnical recommendations for the design of foundations, floor slabs, and pavements for the proposed development at 212 Freeman Lake Park Rd in Elizabethtown, Hardin County, Kentucky. Also included are geotechnical subgrade preparation and fill placement guidelines. The recommendations developed for this report are based on project information supplied by Mr. Brad Boaz of CMW Architects & Engineers.

1.2 SCOPE OF SERVICES

Ten (10) soil test borings were performed at requested locations in the proposed construction area. A laboratory testing program was also implemented to characterize the physical and engineering properties of the subsurface soils. This report describes our exploratory and testing procedures, presents our findings and evaluations, and includes the following:

- Summary of the project information provided.
- Description of existing site conditions, reported geology, and encountered subsurface conditions.
- Assessment of general adequacy of the site for the intended use from a geotechnical standpoint.
- Site preparation and structural fill placement recommendations.
- Recommended foundation type(s), design parameters, and construction guidelines.
- Recommended ground floor bearing parameters and construction guidelines.
- Recommended flexible and rigid pavement design parameters and construction guidelines.
- Site class for seismic design based on the boring data and on available data from the vicinity.
- Other identified geotechnical concerns and recommended additional sampling/testing/analysis.

Our services were provided in accordance with our Terms and Conditions of Service included in our Proposal No. 61:P2845, dated August 18, 2022.

2.0 PROJECT INFORMATION

2.1 SITE INFORMATION

SUBJECT	SUMMARY OF EXISTING SITE CONDITIONS
Site Address	The site was located at Freeman Lake Park at 212 Freeman Lake Park Rd, Elizabethtown, Hardin County, Kentucky. Refer to **Site Location Diagram** in **Appendix** for approximate location of site.
General Description & Topography	The proposed construction areas mainly consisted of undeveloped land/landscaping areas and existing access roads. The site generally sloped down from northwest to southeast-east with a maximum elevation difference of approximately 26 feet across the proposed construction areas.
Surface Water Drainage	Surface drainage appeared to be fair.
Ground Cover	Topsoil in unpaved areas; and asphalt in paved areas.

2.2 PROPOSED CONSTRUCTION

SUBJECT	DESIGN INFORMATION / EXPECTATIONS
Project Description	Planned construction consists of new tennis courts, a playground, an open-air shelter with restrooms, a separate restroom building, and associated access roads and parking areas
Usage	Recreational.
Maximum Column Loads	Less than 50 kips (assumed).
Maximum Wall Loads	Less than 3 kips per linear foot (assumed).
Finish Floor Elevation	Proposed Shelter: EL 756 feet (assumed). Proposed Restroom: EL 760 feet (assumed).
Maximum Cut/Fill	± 1 foot within building areas (assumed).
Design Traffic Loads	Light Duty: Daily 18-kip equivalent axle load of 5 (parking areas for cars and light trucks). Heavy Duty: Daily 18-kip equivalent axle load of 15 (drive lanes and entrances for cars, light trucks, and the occasional garbage truck).

3.0 SITE GEOLOGY

According to the Geologic Map of the Elizabethtown Quadrangle, Hardin and Larue Counties, Kentucky published by the United States Geological Survey (USGS), and information obtained from the Kentucky Geological Survey (KGS) Geologic Information Service website, the subject site was underlain by St. Louis Limestone formation.

Site Geology - Underlying Formations [1]		
FORMATION	**DESCRIPTION**	**KARST POTENTIAL[2,3]**
St. Louis Limestone (Upper Mississippian)	**Primary Lithology:** Limestone, Dolomite, and Shale **Description:** Limestone is yellowish, light olive, to medium bluish gray; very fine to fine grained; thin to thick bedded, locally laminated to very thin bedded where clayey or dolomitic. Dolomite is light olive gray; weathers yellowish gray; very fine grained to fine grained, thin to thick bedded, contains fist-sized pockets of crystalline calcite. Shale is yellowish green to dark brown, calcareous, and carbonaceous, in thin beds. Chert and silicified limestone occur in irregular to smooth tabular masses; thick persistent zone near base.	Very High[4]

Notes:

(1) Source: Geologic Map of the Elizabethtown Quadrangle, Hardin and Larue Counties, Kentucky published by the United States Geological Survey, and information obtained from the KGS Geologic Map Information Service website.

(2) Karst is topography commonly formed over limestone or dolomite and characterized by sinkholes, irregular rock conditions, underground drainage, springs, and caves.

(3) The karst potential level is based on the tendency for the site to develop or have karst features and is not necessarily indicative of the actual presence or absence of existing karst activity at the site.

(4) According to the KGS Potential Classification definitions, formations designated with a “very high” karst potential are where formations will exhibit mature karst, including caves, sinkholes, and springs where they crop out.

4.0 FIELD EXPLORATION AND LABORATORY TESTING

4.1 SUBSURFACE CHARACTERIZATION

SUBJECT	SUMMARY OF SUBSURFACE EXPLORATION (1)
Boring Method	Direct Push.
Sampling Method	Standard Penetration Testing (ASTM D-1586).
Number of Borings	Ten (10) soil test borings.
Boring Locations	Refer to **Boring Location Plan** in the **Appendix** for specific locations.
Boring Depths	Refer to **Boring Records** and **Refusal Summary Sheet** in the **Appendix**.
Logging Method	Full-time presence of an ECS engineer to observe, manage, and document the drilling, sampling and testing results, and encountered conditions. Water level measurement obtained in boreholes during drilling.
Groundwater	Groundwater was not encountered in borings at the time of drilling.
Refusal (2)	Direct Push refusal was encountered in four (4) borings at 15.3 to 16.7 feet below existing grades. Refusal was not encountered in six (6) borings prior to boring termination at approximately 10.5 feet below existing grades.

Notes:

(1) Detailed descriptions of the exploration methods are listed in the **Field Procedures** section of the **Appendix**.

(2) Refusal is the term applied to material that cannot be penetrated with drilling tools or has a standard penetration resistance exceeding 50 blows per 6-inch increment or 10 blows with little to no penetration of the splitspoon. Refusal may be encountered on continuous bedrock, discontinuous floaters, cemented soil, weathered rock, debris, buried structures, or other hard subsurface materials.

The following sections provide generalized characterizations of the soil strata. Please refer to the **Boring Records** and **Boring Composite** in the **Appendix** for detail at specific boring locations.

APPROXIMATE DEPTH (FT)	STRATUM	DESCRIPTION	N-VALUES BLOWS PER FOOT (BPF)(2)
0 – 1.5	I	**TOPSOIL –** Approximately 1 to 4 inches. **ASPHALT –** Approximately 5 inches followed by 13 inches of gravel. Encountered in Boring B-10.	N/A
0.1 – 6.0	II	**FILL –** Brown, gray, gray brown, red brown, low to moderate plasticity, dry to moist, silty clay with trace to few organics and trace to mostly crushed stone. Fill was not encountered in Boring B-10.	5 to 50/2”
1.5 – 16.7	III	**LEAN CLAY (CL) –** Brown, red brown, orange brown, low to moderate plasticity, soft to hard, slightly moist to very moist, silty LEAN CLAY (CL) with varying amounts of black oxide nodules and chert fragments.	3 to 28

Notes:

(1) This summary is generalized and does not describe the actual conditions in each boring. These zones also may not occur at each location. Depths are approximate. Detailed descriptions of the encountered materials are listed on the **Boring Records** in the **Appendix**.

(2) BPF – Blows per Foot

4.2 LABORATORY TEST SUMMARY

Laboratory testing was performed on selected samples obtained during our field exploration operations. Classification and index property tests were performed. The laboratory testing program included:

- Natural Moisture Content
- Atterberg Limits

Each sample was visually classified on the basis of texture and plasticity in accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures), including Unified Soil Classification System (USCS) classification symbols, and ASTM D2487 Standard Practice for Classification for Engineering Purposes. After classification, the samples were grouped in the major zones noted on the **Boring Records** in the **Appendix**. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the logs are approximate; in situ, the transitions may be gradual.

SUMMARY OF LABORATORY TEST RESULTS [(1), (2)]					
STRATUM	**MOISTURE CONTENT (%)**	**LIQUID LIMIT**	**PLASTIC LIMIT**	**PLASTICITY INDEX**	**UNIFIED SOIL CLASSIFICATION**
II	9.3 – 15.9	-	-	-	-
III	16.8 – 31.9	43,43	22,19	21,24	CL

Notes:

(1) A more detailed summary of the laboratory test results is included on the **Boring Records** in the **Appendix**. Detailed descriptions of the laboratory test methods are listed in the **Laboratory Procedures** section of the **Appendix.**

(2) This table only summarizes the laboratory test results conducted on samples obtained from the recent exploration.

5.0 GEOTECHNICAL CONCERNS

Analysis of the provided project information, observed site conditions, encountered subsurface conditions, and our experience with similar projects, revealed the following important geotechnical considerations. These considerations should be properly addressed in planning, budgeting, design, and construction phases to reduce impacts on construction cost, completion schedule, performance of the building and site improvements, and long-term maintenance of the proposed construction. Our recommendations for addressing these concerns are provided in subsequent sections of this report.

5.1 EXISTING FILL

- Existing fill was encountered in nine of the borings (except Boring B-10). Existing fill should be anticipated within and surrounding the proposed structures and pavement areas.
- The existing fill should be considered uncontrolled/undocumented fill since no records are available documenting the material quality or content. The unknown quality, consistency, and behavior characteristics of uncontrolled fill creates concerns for the behavior of overlying construction.
- Potential problems for the proposed construction created by the presence of the existing uncontrolled fill include larger than normal total and differential settlements, collapse of buried objects, and poor bearing support. The manifestation of these problems can cause poor foundation, slab, and pavement performance.
- Because of the unacceptably high risks associated with uncontrolled fill in foundation areas, support of new foundations on uncontrolled fill is not recommended.
- In some cases, existing fill could be left in place in new floor slab and pavement areas if the owner is willing to accept the associated risks, including, but not limited to greater than normal distress and future repair.

5.2 EXISTING SURFACES

- Existing paved surfaces associated with the existing access roads were observed in the proposed construction areas (for example Boring B-10).
- Existing pavements should be left in-place as long as possible, to act as a construction platform.
- Water is commonly trapped under paved surfaces. Accordingly, soft, saturated soils may be present in some areas below these existing surfaces.
- Water seepage into excavations from the existing gravel base and utility backfill should be anticipated.
- Moisture conditioning of soils underlying these surface materials commonly is necessary and should be anticipated for this project.
- In addition, pavements, commonly obscure the presence of soft soils. Some undercutting of soft soils below these surface materials should be anticipated.

5.3 KARST

- The site was underlain by a geologic formation that has a very high potential for solution features, such an irregular rock surface, isolated rock slabs or "floaters", sinkholes, soil-filled or open joints and bedding planes, springs, etc.
- No closed depressions or karst features were identified during the site reconnaissance, or in the documents reviewed (i.e., topographic maps, geologic maps, aerial photos, etc.) within the proposed construction areas.
- Soft to firm, and very moist soils were encountered in Boring B-07 and B-08 prior to refusal depth which could be an indication of early stages of karst activities. However, considering the consistent refusal depths encountered in our borings (15.3 to 16.7 feet below existing grades) and the encountered soil profile in these areas, further exploration is not necessary at this time.
- Construction in karst areas presents risks that the owner must be willing to accept. The primary geotechnical risks include:
  - Settlement, subsidence and/or collapse of the subsurface materials.
  - Deposits of soft and/or organic soils in existing sinkholes.
  - Irregular upper rock surface, discontinuous rock layers, highly weathered rock, and generally variable conditions.
  - Poor correlation between refusal depths and the actual depth to rock.
- Changes to natural sinkhole/spring drainage systems, as well as poor surface drainage, and leaking water or sewer lines can lead to the development of new sinkholes.
- Site development costs typically are higher in karst areas due to the costs associated with reducing the karst risks during design and construction.
- The risks associated with karst topography are common for the project vicinity, are not unique to the site, and can be reduced, but not eliminated, by following the recommendations provided in this report.
- Treatment of individual sinkholes, if encountered, is heavily dependent on the specific conditions unique to each sinkhole, but typically would consist of stabilization of the feature and construction of an inverted filter over the feature (larger rocks progressing to smaller rocks, enclosed in non-woven filter fabric).

5.4 TREES

- Sparse trees were located within the proposed construction areas.
- Organic matter, roots, topsoil, and inadequate soils are associated with trees and heavy vegetative growth.
- Structural problems can result if trees and root balls are not properly removed and backfilled or if topsoil depths are not removed during the earthwork operations.
- Fill material that contains significant roots (i.e., more than 3 percent organics as determined by loss-on-ignition testing) is not adequate for use as controlled fill.
- It is important to note that the topsoil depths reported for this exploration were based on measurements in specific small-diameter samples, which were representative of that location but may not have been representative of each condition or predominant conditions.

- To efficiently remove extensive or pervasive root systems associated with "localized" heavily vegetated areas (e.g.., pockets of trees or heavily overgrown areas) and to create a subgrade that drains, it is sometimes necessary to remove topsoil to a consistent depth over an area that exceeds the specific topsoil depths in localized areas (e.g., may strip 12 inches in an area even though the topsoil depths varied from 4 to 12 inches).
- Stripping more than the reported topsoil depths should be expected in some areas, especially areas with current or past heavy vegetation growth or trees.

5.5 DEGRADABLE SOILS

- Most of the soils on-site are susceptible to degradation. Degradable soils readily lose strength, become soft, and "pump" when subjected to construction equipment, especially under wet conditions.
- Undercutting and/or stabilization of soft clay soils could have a cost impact on the project, especially if not properly addressed in the project documents (e.g., definition of what is inadequate and the responsibility for maintenance of these soils once stabilized) or if not properly addressed during construction (e.g., subjected to repeated construction traffic with no protection).

5.6 REUSE OF ON-SITE SOILS

- In general, most of the on-site soils appeared adequate for reuse as structural fill provided the soils are moisture conditioned to appropriate moisture contents for compaction.
- Existing fill may be considered for reuse provided no inadequate materials are present. Sorting to remove inadequate (e.g., organics, remnant topsoil, remnant construction debris, etc.) or oversized material from the existing fill should be expected prior to reuse.
- Some wetting, drying, mixing or chemical treatment of the soils may be necessary to obtain workable moisture contents for the on-site soils, especially during wetter times of the year.
- Reuse of the on-site soils will be subject to the weather considerations described subsequently.

5.7 SUBGRADE IMPROVEMENT

- Localized improvements will likely be needed in some areas, especially if construction occurs during the wetter/cooler periods of the year.
- The required extent of improvement will depend to a large degree on when earthwork operations take place as well as on how the earthwork contractor prepares the site. The level of improvement likely will increase if:
  - Construction traffic is concentrated along localized soft or poor subgrade routes.
  - Earthwork occurs during cool, wet periods (typically November through May).
- Provided construction occurs during the drier time of the year, it would be our expectation that much of the improvement could be achieved by scarifying, drying and recompacting the soils. If construction occurs during the wetter periods of the year, more aggressive treatment would be likely required (i.e., removal and replacement or lime drying).
- Subgrade improvement alternatives, if required, include but are not limited to:
  - Scarification, drying, and recompaction of surface materials.
  - Removal of inadequate materials and replacement with structural fill.
  - Bridging with a thick lift of limestone aggregate.
  - Placement of a geosynthetic or geo-grid in combination with granular fill.

  - Chemical stabilization and/or modification (e.g., kiln dust, lime, or Portland cement).
- The type of subgrade improvement chosen should take weather limitations, or other limitations unique to each method, into consideration.

5.8 WEATHER CONSIDERATIONS

- Conducting site work during periods of cool and/or wet weather (typically November to May) can be problematic for sites in the project region.
- Proper compaction of clay fill generally is very difficult to achieve during periods of cool and/or wet weather. Some drying, mixing, or chemical treatment of the soils would be necessary to obtain workable moisture contents for the on-site soils or proposed borrow materials if placed during the cool, wet seasons.
- If compaction of clay fill takes place under wet weather conditions, increased earthwork costs, an extended construction schedule, and soil improvement (likely chemical stabilization) likely would be required. In addition, reuse of the site soils may be severely limited.
- Surface soils tend to be softer during wet weather conditions due to the excess moisture in the near surface soils.
- Weather-softened surface soils tend to result in more undercutting and/or stabilization than would be required during dry weather conditions, which increases site development costs.
- Project specifications should include definitions and require contractors to provide unit rates for subgrade stabilization, removal of inadequate soils, and replacement of inadequate soils with Structural Fill appropriate for use during the anticipated construction season.

6.0 SITE CONSTRUCTION RECOMMENDATIONS

6.1 PLANNING

- Adjust project plans, specifications, schedules and budgets to incorporate the issues discussed in **Section 5.0** and the recommendations provided herein.
- It will be critical that the planning of earthwork operations is carefully considered and executed given the presence of degradable soils.
- Findings and recommendations in this report were based on assumed finish floor elevations. As such, ECS should be contacted to provide appropriate values and recommendations for changes to the assumed elevations.

6.2 SUBGRADE PREPARATION

- Localized improvements will likely be needed in some areas, especially if construction occurs during the wetter/cooler periods of the year.
- The depth and extent of improvement required will be dependent on the time of year of construction, the weather preceding site work, and the site work techniques employed.
- The following subsections describe our general recommendations for preparing the site subgrade prior to fill placement operations.

Stripping and Grubbing:

- Materials required to be stripped:
  - Existing pavements (leave in place as long as possible to reduce degrading of underlying soils), topsoil and vegetation, large root zones, organic material, and excessively wet, desiccated, frozen, contaminated, existing fill, or otherwise inadequate materials.
- Minimum extent of stripping:
  - 10 feet beyond the building limits.
  - 5 feet beyond the pavement limits.
- ECS should observe and document that poor surficial materials have been removed prior to the placement of Structural Fill or construction of structures.
- Stripped material not meeting Structural Fill requirements should be considered for reuse in landscaped areas only.

Subgrade Evaluation:

- Proofroll the site in the presence of an ECS representative with a pneumatic-tired vehicle (e.g., triaxial dump truck) loaded as recommended by the ECS representative.
- Proofroll subgrades prior to filling or after excavation to grade.
- Proofroll slab and pavement subgrades prior to granular base placement.
- Areas judged by the ECS representative to deflect excessively during proofrolling should be remediated in accordance with ECS recommendations provided at that time.
- Prepare subgrades with a slight slope to maintain surface drainage.

Other Measures:

- Roll subgrade surfaces smooth if rain is expected.
- Slope final subgrades away from the proposed structure.
- Rough grade subgrades high to allow for removal of degraded soil.
- Remove soil frozen or softened by rain.

6.3 STRUCTURAL FILL

Subgrade Requirements:

- Subgrade proofrolled and required improvements completed.

Fill Material Requirements:

- No deleterious debris.
- No rock pieces larger than 3 inches.
- Less than 3% organic material (loss on ignition).
- Maximum dry density of at least 100 pcf according to the Standard Proctor compaction method (ASTM D-698), unless specifically reviewed otherwise by ECS.
- Acceptable Unified Soil Classifications (USCS): CL, ML, GW, GM, GC, GP, SW, SP, SM, SC.
- Unacceptable USCS classifications: CH (see **Section 6.5**), OL, OH, Pt, MH.
- Evaluated and approved by ECS prior to construction.

Fill Placement Guidelines:

- Minimum compaction:
  - 98 % Standard Proctor maximum dry density (ASTM D-698).
- Moisture Content:
  - Within 2 % of optimum (ASTM D-698) if plasticity index less than 30.
- Maximum loose lift thickness: 8 inches.
- Compaction test frequency:
  - One test per lift for each 5,000 square feet of fill placed.
  - Minimum of 3 tests per lift.
- Bench new fill into existing slopes or sidewalls of deep excavations in 1-foot steps or as recommended by ECS at the time of construction.
- Compact and test each lift prior to placing additional lifts.
- Scarify smoothed fill surfaces prior to placing the next lift.
- Maintain positive surface drainage on fill surfaces during placement to avoid ponding of water.
- Roll fill surfaces smooth if rain is expected.
- Rough grade high to allow for removal of degraded surface soils if fill will be exposed to adverse weather conditions.
- Do not place fill on a frozen subgrade. At a minimum, remove frozen material, or allow to thaw and then recompact.

6.4 EXISTING FILL

General Comments:

- The recommendations contained in this report assumed that the existing fill is uncontrolled fill.

Foundations:

- Foundations should not bear in or over the existing fill.
- Foundations should penetrate the existing fill and bear on adequate stiff native soil, or Structural Fill.
- Replacement fill should be placed and compacted in accordance with the recommendations provided in this report for Structural Fill.

Floor and Pavement Areas:

- The existing fill may be left in-place in the floor and pavement areas provided:
  - The owner accepts the risks associated with the leaving the existing fill in-place.
  - Existing fill subgrade is judged adequate by ECS under the required proofroll load or improvement of the subgrade is completed where and how as recommended by ECS based on the results of the visual observations and proofrolling at the time of construction.
- If the risks associated with the existing fill, as described in this report, are not acceptable to the owner, the existing fill in the building and pavement areas should be removed and replaced with Structural Fill.

6.5 KARST

- Construction in karst areas presents risks that the owner must be willing to accept. The following measures can reduce these risks:
  - Evaluate and proofroll the slab and pavement subgrades under the direction of an ECS representative at the time of construction.
  - Remediate disclosed karst features per recommendations provided by ECS during construction.
  - Provide proper drainage around the proposed construction, including sloping the surface away from the building.
  - Roof drains should not discharge onto the ground surface within 20 feet of the proposed structures unless the surface is impervious (such as concrete or pavement).

7.0 DESIGN RECOMMENDATIONS

7.1 SHALLOW FOUNDATIONS

General Comments:

- The proposed buildings may be supported on conventional shallow foundations.
- Foundations should bear on stiff or stronger undisturbed clay, Structural Fill, flowable fill, or lean concrete. Foundations should not be supported in or over the existing fill.
- Foundation bearing conditions should be carefully evaluated by ECS during construction.

Foundation Design Recommendations:

- The design of the foundation should utilize the following parameters:

FOUNDATION DESIGN RECOMMENDATIONS		
DESIGN PARAMETER	**SOIL BEARING**	
	CONTINUOUS WALL FOUNDATIONS	**ISOLATED COLUMN FOUNDATIONS**
Net Allowable Bearing Pressure (1)	2,000 psf	2,400 psf
Acceptable Bearing Material	Stiff Undisturbed Native Soils or Structural Fill.	Stiff Undisturbed Native Soils or Structural Fill
Minimum Width	18 inches	24 inches
Depth of Foundations Subject to Freezing (Below slab or finished grade) (2)	30 inches	30 inches
Depth Foundations Protected from Freezing	12 inches	12 inches
Estimated Total Settlement (4)	≤ 1 inch	≤ 1 inch
Estimated Differential Settlement (4)	≤ ¾ inch along 50 feet	≤ ¾ inch between columns

Notes:

(1) Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.

(2) The 2018 Kentucky Building Code requires a minimum foundation embedment depth of 24 inches for foundations subject to freezing in Hardin County. However, a minimum embedment of 30 inches is common for commercial development in the project region.

(3) The recommended net allowable bearing pressures may be increased 33 percent for transient loading.

(4) The estimated settlement potential is based on the following: empirical guidelines for the project soil types and consistencies; the assumption that ECS will observe and test each foundation excavation during construction; and the provided project information. Actual settlements will depend, in part, on site preparation and conditions at each foundation location.

SOIL PARAMETERS FOR FOUNDATION LATERAL RESISTANCE	ESTIMATED VALUE (1)
Coefficient of Active Earth Pressure (Ko) (2)	0.41
Coefficient of At-Rest Earth Pressure (Ko) (2)	0.58
Coefficient of Passive Earth Pressure (K_p) (2)	2.46
Moist Unit Weight of Soil (γ)	125 pcf
Base Shear Adhesion [Concrete on Undisturbed Clay]	350 psf
Coefficient of Friction [Concrete on Clay] (μ)	0.30

Notes:
(1) These design parameters do not include factors of safety. Appropriate factors of safety should be included in the designs.
(2) Provided earth pressure coefficients are based on an assumed internal angle of friction (ϕ) of 25 degrees for clay.

- Desiccation or disturbance may result in soil voids or cracks adjacent to foundations, reducing passive and uplift resistance. As a result, for these calculations, the upper 2.5 feet of soils should be neglected for passive resistance.
- Ignore passive earth pressure if the soil against the sides of the foundations may not be present during the life of the structure (e.g., the soil could be excavated or be subject to erosion).

Construction Guidelines:

- The bearing conditions of each foundation should be evaluated by ECS at the time of construction to confirm the presence of adequate bearing soils and to provide recommendations for the remediation of poor soils, if present. This evaluation should be performed before the reinforcing steel is placed in the excavations.
- Concrete should be placed the same day the foundations are excavated to reduce degradation of the bearing surface due to exposure. Alternatively, a "mud mat" of lean concrete should be placed to protect the bearing surface.
- Disturbed, degraded or loose material should be removed from the excavation bottoms prior to concrete placement.

7.2 FLOOR SLABS

Recommended Slab Type:

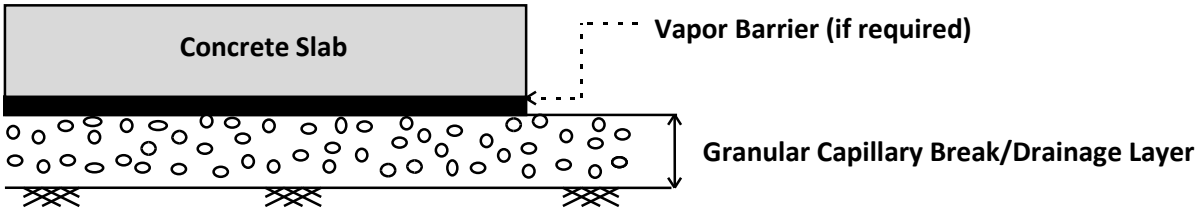
- Grade supported floor slabs

Floor Subgrade Recommendations:

- Prepare subgrade in accordance with recommendations contained within this report.
- Subgrade proofrolled by an ECS representative and required improvements completed.
- Subgrade modulus for slab design: 100 pci.
- Place a minimum of 4 inches of well-graded crushed stone or angular sand base.
- Compact base material in accordance with the Structural Fill recommendations provided previously.
- Unless specifically approved otherwise, do not support floor slabs directly over open-graded coarse aggregate to avoid loss of concrete, increased concrete cracking during

drying shrinkage, and puncture of the vapor barrier. If coarse aggregate is used as a drainage base, cap the coarse aggregate with a 2-inch (minimum) layer of well-graded aggregate (e.g., KYTC DGA).

- The following graphic depicts our soil-supported slab recommendations:



Notes:

(1) Drainage layer should consist of a minimum of 4 inches of open-graded coarse gravel capped with a minimum 2-inch layer of coarse aggregate with fines (e.g., KYTC DGA).

(2) Subgrade compacted to 98% maximum dry density per ASTM D698.

Construction Guidelines:

- If a vapor barrier will be used, an adequate concrete design mix, placement, finishing, and curing techniques should be employed to reduce the potential for differential slab shrinkage, cracking, and curling.
- Special care should be taken to avoid puncturing the vapor barrier during construction. We recommend utilizing the ACI 302 guidelines for placement of the vapor barrier, manufactured sand layer, and concrete as a function of the construction sequence.
- Drying shrinkage and concrete curing methods frequently causes floor slab cracks. Control joints and saw cuts should be installed in accordance with ACI guidelines to control cracking.
- Slab joints should be doweled or keyed to allow rotation of the slab sections without localized vertical displacement.
- Penetrations of the floor slab by fixed objects, such as drains or piping, restrict shrinkage movement and should be isolated to reduce cracking potential.
- Slab-on-grade floor should be structurally isolated from foundation supported walls.
- Backfill along foundation excavations should be carefully controlled to reduce differential slab settlement.

7.3 SEISMIC DESIGN CONSIDERATIONS

- The 2018 Kentucky Building Code (KBC) requires site classification for seismic design based on the upper 100 feet of a soil profile. At least two methods are utilized in classifying sites, namely the shear wave velocity (vs) method and the Standard Penetration Resistance (N-value) method. The second method (N-value) was used in classifying this site.
- Based upon our interpretation of the subsurface conditions, the appropriate Seismic Site Classification is **"C"** as shown in the following table.

SEISMIC SITE CLASSIFICATION			
Site Class	**Soil Profile Name**	**Shear Wave Velocity, Vs, (ft./s)**	**N value (bpf)**
A	Hard Rock	Vs > 5,000 fps	N/A
B	Rock	2,500 < Vs ≤ 5,000 fps	N/A
C	Very dense soil and soft rock	1,200 < Vs ≤ 2,500 fps	>50
D	Stiff Soil Profile	600 ≤ Vs ≤ 1,200 fps	15 to 50
E	Soft Soil Profile	Vs < 600 fps	<15

Ground Motion Parameters:

- In addition to the seismic site classification noted above, ECS has determined the design spectral response acceleration parameters following the International Building Code (IBC) 2015 methodology. The Mapped Reponses were estimated from the OSHPD Seismic Design Map website (http://seismicmaps.org/). The design responses for the short (0.2-sec, S_{DS}) and 1-second period (S_{D1}) are noted at the right end of the following Table:

GROUND MOTION PARAMETERS [IBC 2015 Method]								
Period (sec)	**Mapped Spectral Response Accelerations (g)**		**Values of Site Coefficient for Site Class**		**Maximum Spectral Response Acceleration Adjusted for Site Class (g)**		**Design Spectral Response Acceleration (g)**	
0.2	S_S	0.222	F_a	1.2	$S_{MS}=F_aS_s$	0.267	$S_{DS}=2/3\ S_{MS}$	**0.178**
1.0	S_1	0.115	F_v	1.685	$S_{M1}=F_vS_1$	0.193	$S_{D1}=2/3\ S_{M1}$	**0.129**

- The Site Class definition should not be confused with the Seismic Design Category designation which the Structural Engineer typically assesses.

7.4 FLEXIBLE PAVEMENT DESIGN

Application:

- Main driving lanes, parking areas or other locations where heavy vehicle or other equipment will not turn on a tight radius or be parked for extended periods of time.

General Comments:

- The pavement sections below are guidelines that may or may not comply with local jurisdictional minimums.
- If the traffic loads, Daily Equivalent 18-kip Axle Loads (DEALs), used in this report differ from the expected traffic loads onsite, ECS should be contacted to modify the pavement design.

FLEXIBLE DESIGN PARAMETERS	
Design Method	AASHTO Guide for Design of Pavement Structures (1993)
Daily Equivalent 18-KIP Axle Loads	5 (Light Duty) – Car parking. 15 (Heavy Duty) – Drive lane and entrances for cars and occasional heavy truck traffic.
Design Life	20 Years
California Bearing Ratio (CBR)	3 (Estimated)
Reliability	80%
Terminal Serviceability Index	2.0

RECOMMENDED FLEXIBLE PAVEMENT SECTIONS [(1)]			
Pavement Section	**Hot Mix Asphalt Wearing Surface**	**Hot Mix Asphalt Binder or Base**	**Granular Base Kentucky DGA**
Light Duty	1 ½ inches	1 ½ inches	8 inches
Heavy Duty	1 ½ inches	2 ½ inches	8 inches

Notes:

(1) It should be noted that although flexible pavement for the 20-year design period is structurally sound, an asphalt overlay is usually necessary after 7 to 12 years due to normal wear and exposure of the surfacing layer. In general, asphalt pavement should be sealed approximately 3 to 5 years to extend the life of the asphalt.

Subgrade Requirements:

- Prepare subgrade in accordance with recommendations contained within this report.
- Proofroll in the presence of an ECS representative and complete required improvements.
- Pavement subgrades sloped to facilitate drainage.

Drainage Requirements:

- Permit water movement beneath curbs at the subgrade level.
- Design catch basins to include finger drains at the granular base level.

Construction Guidelines

- Pavements should be constructed in accordance with the construction and material guidelines in the most recent edition of the Kentucky Transportation Cabinet's "Standard Specifications for Road and Bridge Construction."
- Granular base should be compacted in accordance with the structural fill recommendations provided in a previous section.
- In-place density, thickness, and gradation tests should be conducted by a ECS representative on the pavement components during construction to confirm compliance with project specifications.

7.5 RIGID PAVEMENT DESIGN

Application:

- Rigid pavements are adequate wherever flexible pavements can be used. Rigid pavements often provide better service for dumpster aprons, entranceways, or other areas where heavy trucks will turn on a tight radius or be parked for extended periods of time.

General Comments:

- The pavement sections below are guidelines that may or may not comply with local jurisdictional minimums.

RIGID PAVEMENT DESIGN PARAMETERS	
Design Method	ACI Guide for the Design and Construction of Concrete Parking Lots (ACI 330R-08)
Traffic Category	A (Light Duty): Car parking areas and access lanes B (Heavy Duty): Entrance and service lanes.
Design Life	20 Years
California Bearing Ratio (CBR)	3 (Estimated)
Effective Subgrade Modulus	100 pci
Concrete Modulus of Rupture	550 psi

RECOMMENDED RIGID PAVEMENT SECTIONS		
Pavement Section	**Portland Cement Concrete**	**Granular Base Kentucky DGA**
Light Duty	5 inches	5 inches
Heavy Duty	6 inches (1)	5 inches

Notes:

(1) Dumpster pad should be a minimum of 7 inches to resist concentrated loads of refuse truck operations.

Subgrade Requirements:

- Prepare subgrade in accordance with recommendations contained within this report.
- Proofroll in the presence of an ECS representative and complete required improvements.
- Pavement subgrades sloped to facilitate drainage.

Drainage Requirements:

- Permit water movement beneath curbs at the subgrade level.
- Design catch basins to include finger drains at the granular base level.

Concrete Recommendations:

- 4,000 pounds per square inch (psi) minimum 28-day compressive strength.
- 4 to 6 percent entrained air.

- Proper joint spacing to control shrinkage cracking.
- Dowels at construction joints to properly transfer loads between pavement sections.
- Control joints where concrete pavement abuts fixed structures or protrusions.

8.0 CLOSING

There are certain limitations inherent to geotechnical explorations and reports. These limitations are discussed below and in the **GBA "Important Information About Your Geotechnical Engineering Report"** in the **Appendix**. They should be fully considered prior to using the recommendations in this report.

Our geotechnical exploration identified the subsurface conditions that existed only at the locations and times that the borings were advanced. Given the natural variable characteristics of soil and rock, conditions may vary over short distances, change with time, or be affected by natural events, such as floods or earthquakes, or by human activity, such as past land use or new construction. As such, the information generated during our geotechnical exploration may not be representative of the entire conditions that may exist on the project site now or in the future. We use our professional judgment to render an opinion about the subsurface conditions that may exist in the areas of the site not specifically tested during our exploration based on our review of available field and laboratory data and our past experience with similar subsurface conditions. However, the subsurface conditions encountered during construction may vary from the assumed conditions. Variations in the subsurface conditions between our borings and in unexplored areas of the site could affect our interpretations. Thus, it is important to retain ECS to provide construction monitoring services based on our involvement in the project, our knowledge about the site, and our knowledge relating to the assumptions and recommendations contained within this report.

The recommendations contained within this report are dependent on many factors, including, but not limited to, the project information provided by others and the specific conditions encountered during our exploration. If the project information contained within this report is incorrect or changed at a later date or if the location or nature of the structures or facility components changes, ECS should be notified and given the chance to assess the impact of the changes. We cannot and do not accept responsibility or liability for problems that occur because we were not given the opportunity to properly assess changes to the project. The recommendations contained in this report must not be considered valid unless our firm reviews such changes and required modifications to our recommendations are verified in writing.

Our recommendations are dependent on several factors including, but not limited to, our review of project drawings and specifications prior to construction and observation of actual conditions during construction, including providing the required Special Inspections. We strongly recommend that ECS be retained to review pertinent portions of the project plans and specifications.

This report should be reproduced in its entirety only. Portions of this report should not be separated and used by others. It should be noted that this report was not prepared for the purpose of bid development and should not be used as such.

This geotechnical report is unique and was based on client needs and project requirements for the specific project described in this report. As such, no one other than who the report was intended and prepared for should rely on this report or the information contained within the report without first consulting with ECS. This report is not valid for any purpose or project except as described in this report.

This report and our recommendations were prepared using the generally accepted standards of geotechnical engineers practicing in this region. No warranty is express or implied.

APPENDIX

Site Location Diagram

Boring Location Plan

Soil & Rock Classification

Boring Legend

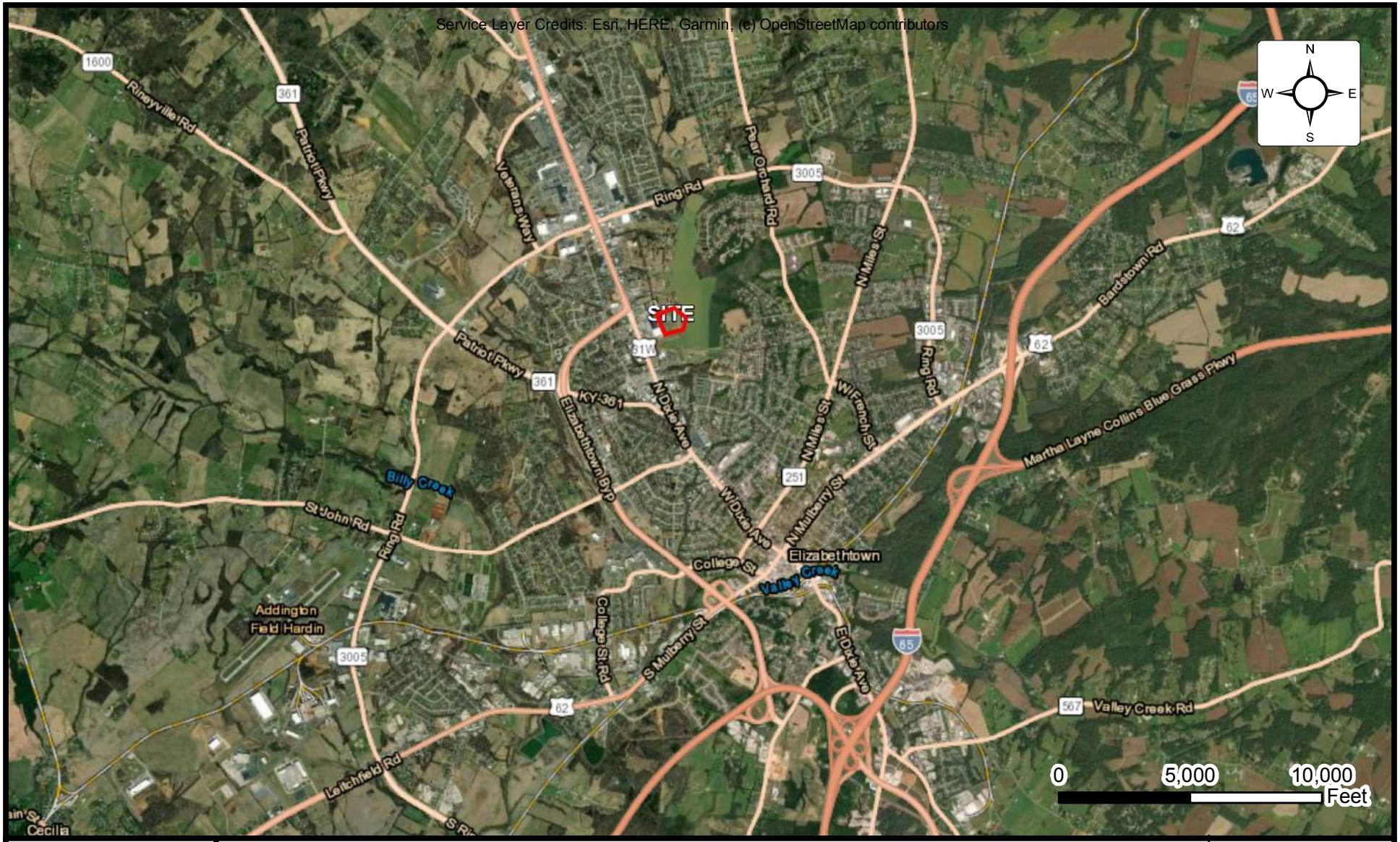
Boring Records

Boring Composite

Field Procedures

Laboratory Procedures

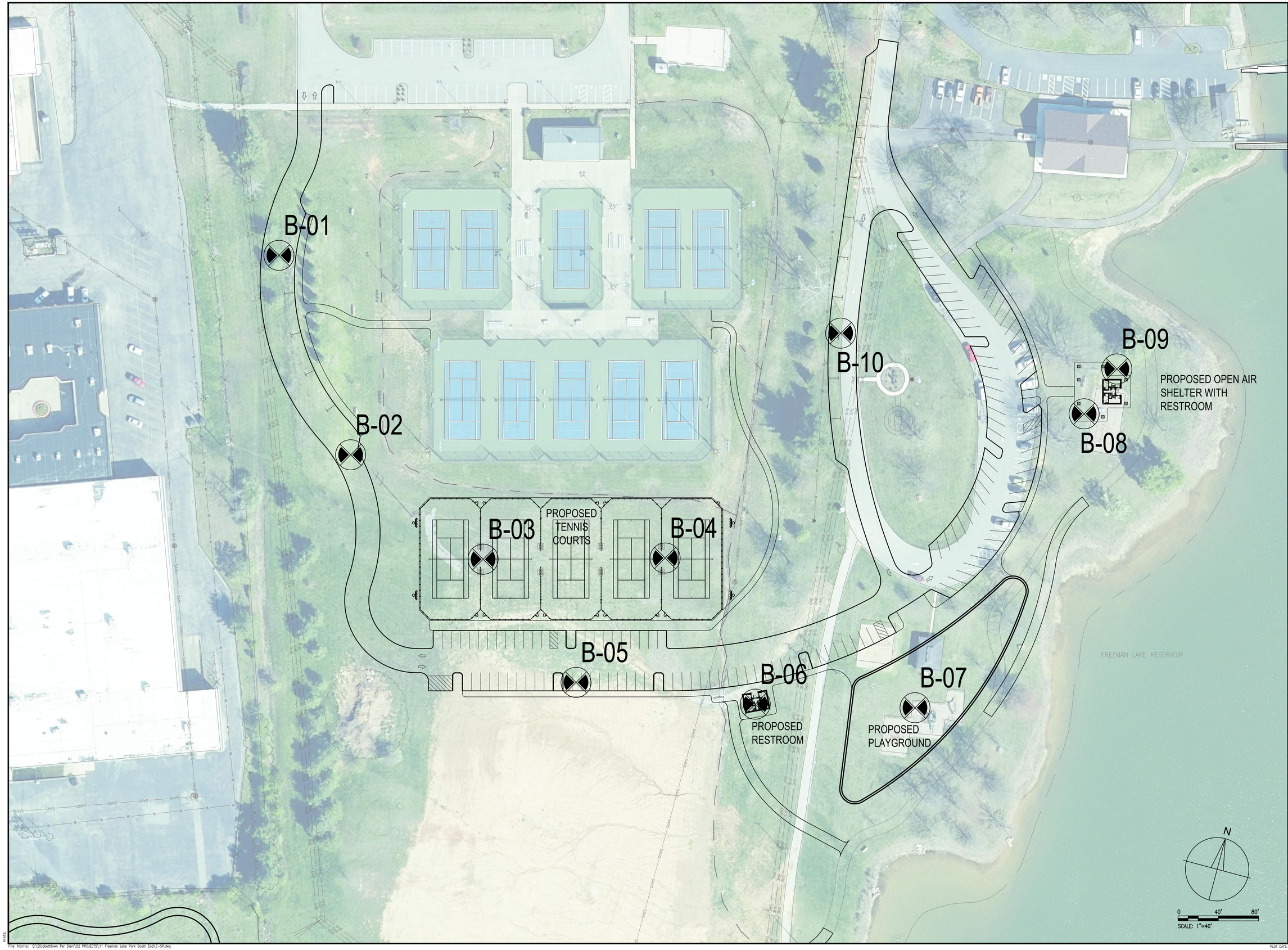
GBA “Important Information About Your Geotechnical Engineering Report”



Site Location Diagram
FREEMAN LAKE PARK - CITY OF ELIZABETHTOWN

212 FREEMAN LAKE PARK RD, ELIZABETHTOWN, KENTUCKY
CITY OF ELIZABETHTOWN, KENTUCKY

ENGINEER	B. HASANZADEH
SCALE	AS NOTED
PROJECT NO.	61:2851
SHEET	1 OF 1
DATE	10/19/2022



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o: (859) 254-6623
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NOT FOR CONSTRUCTION

PROPOSED BORING PLAN

FREEMAN LAKE PARK

FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY

DOCUMENT PHASE

Issue Date:	JUNE 2022
Drawn By:	XX
Checked By:	--
Revisions:	
	-
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Mark	Date

AHJ SEAL

AHJ SEAL

ECS

Xrefs:
File Name: Q:\Elizabethtown Per Diem\02 PROJECTS\11 Freeman Lake Park South End\C-SP.dwg
PLOT DATE: Monday, August 8, 2022 7:29:32 PM

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SOIL & ROCK CLASSIFICATION

SOIL CLASSIFICATION

MAJOR DIVISIONS			SYMBOLS	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE	GRAVEL AND GRAVELLY SOILS	Clean Gravels	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
		Gravels with fines	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SAND AND SANDY SOILS	Clean Sands	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands, gravelly sand, little or no fines
		Sands with fines	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE	SILTS AND CLAYS	Liquid Limit less than 50	ML	Inorganic silts, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to moderate plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS	Liquid Limit greater Than 50	MH	Inorganic silts, micaeceous or diatomaceous fine sand or silty soils
			CH	Inorganic clays of high plasticity
			OH	Organic clays of moderate to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT	Peat, humus, swamp soils with high organic contents

SOIL CONSISTENCY SPT N: Standard Penetration Test N-Value N^1 – Manual Hammer (Rope & Pulley - 60% Efficiency) N^2 – Automatic Hammer (Free-Fall - 96% Efficiency)

COARSE GRAINED SOILS		
SPT N^1	SPT N^2	Relative Density
0-4	0-3	Very loose
4-10	3-6	Loose
10-30	6-19	Medium dense
30-50	19-31	Dense
> 50	> 31	Very dense

FINE GRAINED SOILS		
SPT N^1	SPT N^2	Field Identification
0-2	0-1	Very soft – Easily penetrated several inches by fist
3-4	2-3	Soft – Easily penetrated several inches by thumb
5-7	3-4	Firm – Can be penetrated several inches by thumb with moderate effort
8-15	5-9	Stiff – Readily indented by thumb but penetrated only with great effort
16-30	10-19	Very stiff – Readily indented by thumbnail
> 30	> 19	Hard – Indented with difficulty by thumbnail

SOIL PARTICLE SIZES

Description	Size Limits	Familiar Example
Boulder	12 inches or more	Larger than basketball
Cobble	3 - 12 inches	Orange to basketball
Coarse gravel	¾ - 3 inches	Grape to orange
Fine gravel	4.75 mm (No. 4 sieve) - ¾ inch	Pea to grape
Coarse sand	2-4.75 mm (No. 10 to 4 sieve)	Rock Salt
Medium sand	0.42-2 mm (No. 40 to 10 sieve)	Table Salt
Fine sand	0.075-0.42 mm (No. 200 to 40 sieve)	Powdered sugar
Silt/Clay/Fines	Less than 0.075 mm (No. 200)	Not visible to naked eye

RELATIVE PROPORTIONS

Description	Percent
Trace	1-5
Few	5-15
Little	15-30
Some	30-50
Mostly	50-100

ROCK CONTINUITY

Description	Core Recovery (%)
Incompetent	0-40
Competent	40-70
Fairly Continuous	70-90
Continuous	90-100

ROCK QUALITY DESIGNATION

Description	RQD (%)
Very Poor	0-25
Poor	25-50
Fair	50-75
Good	75-90
Excellent	90-100

ROCK BEDDING

Description	Thickness (in)
Parting	< 0.3
Band	0.3-2.5
Thin Bed	2.5-6.0
Medium bed	6.0-12.0
Thick bed	12.0-36.0
Massive	> 36.0

ROCK HARDNESS (Descriptions for rock core samples)

Description	Definition
Very soft	Can be broken with fingers
Soft	Can be scratched with fingernail; only edges can be broken with fingers
Moderately hard	Can be easily scratched with knife; cannot be scratched with fingernail
Hard	Difficult to scratch with knife; hard hammer blow to break specimen
Very hard	Cannot be scratched with knife; several hard hammer blows to break specimen

ROCK WEATHERING (Descriptions for rock core samples)

Description	Definition
Completely	Rock decomposed to soil; rock fabric and structure completely destroyed
Highly	Most minerals are decomposed; texture indistinct but fabric preserved; strength greatly reduced
Moderately	Discoloration throughout and weaker minerals decomposed; texture preserved but strength less than unweathered rock
Slightly	Discoloration around open fractures; strength preserved
Unweathered	No sign of decomposition

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BORING LEGEND

Scale, ft.	Elevation, ft.	Soil Symbol	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
			TOPSOIL	1.0								
			ASPHALT	2.0								
			GRAVEL, crushed stone, (FILL)	3.0								
			FILL/POSSIBLE FILL	4.0								
5			CLAY, low to moderate plasticity, (CL)	5.0								
			Abbreviations ATD - At the Time of Drilling									
10			Notes Dashed lines indicate an estimated or gradual strata change.									
			Solid lines indicate a more precise, measured depth value.									
15			Splitspoon Sample			16.0 - 17.0						
20												

Scale - Proportional distance below the surface.

Elevation - Vertical distance above or below a benchmark.

Soil Symbol - Graphic representation of subsurface material.

Material Description - Account of encountered materials based on ASTM D-2488.

Depth - Distance below the surface to a strata as measured in the field.

Sample Type - Method for collecting soil or rock specimens.

Sample Depth - Collected specimen interval.

Recovery - Percentage of recovered sample material.

Standard Penetration Test Blows - Number of blows to drive a splitspoon sampler three 6" increments with a 140-lb. hammer falling 30".

N Value - Number of blows to drive the splitspoon the final foot. These blow counts have not been corrected for hammer efficiency or other applicable factors. The manual hammer, if used, has an estimated efficiency of 60%. The automatic hammer, if used, has an estimated efficiency of 96%.

Water Content - The weight of water divided by the weight of oven dried soil, expressed as a percentage.

Uc - Unconfined compressive strength.

Comments - Pertinent comments about the conditions encountered.

Remarks: Additional information about the surface, subsurface or other conditions that could impact the exploration results.

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BORING RECORD

Project Name	**Freeman Lake Park - City of Elizabethtown**	Boring No.	B-01
Location	**212 Freeman Lake Park Rd, Elizabethtown, KY 42701**	Project No.	61:2851
Client	**City of Elizabethtown, Kentucky**	Elevation	775 (a)
Driller	M. Reynolds — Rig Type: Geo-Probe 7700 (Truck-mounted)	Started	9/28/2022
Drill Method	Direct Push — Hammer Type: Automatic	Completed	9/28/2022
Groundwater	Not encountered ATD	Logged By	B. Hasanzadeh
		Weather	60's - Clear

Scale, ft.	Elevation, ft.	Soil Symbol	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
			TOPSOIL, (4 inches)	0.3								
			CLAY, silty, brown, gray, gray brown, low to moderate plasticity, dry to slightly moist, (FILL), with trace to few crushed stone			0.0 - 1.5	100	4-8-8	16	12.5		
				1.9								
2.5	772.5		CLAY, silty, red brown, orange brown, moderate plasticity, very stiff to hard, slightly moist to very moist, (CL), with trace black oxide nodules and chert fragments			1.5 - 3.0	94	5-3-3	6	17.1		
5.0	770.0					4.0 - 5.5	100	8-8-10	18	28.8		
			- with light gray mottling below approximately 6 feet									
7.5	767.5					6.5 - 8.0	100	5-7-8	15			
10.0	765.0					9.0 - 10.5	100	9-10-10	20			
				10.5								
			Boring Terminated									
12.5	762.5											
15.0	760.0											

Remarks: (a) Ground surface elevations estimated to +/- 1-foot from Google Earth Imagery dated 2/21/2020.

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BORING RECORD

Project Name	**Freeman Lake Park - City of Elizabethtown**			Boring No.	B-02
Location	**212 Freeman Lake Park Rd, Elizabethtown, KY 42701**			Project No.	61:2851
Client	**City of Elizabethtown, Kentucky**			Elevation	770 (a)
Driller	M. Reynolds	Rig Type	Geo-Probe 7700 (Truck-mounted)	Started	9/28/2022
Drill Method	Direct Push	Hammer Type	Automatic	Completed	9/28/2022
Groundwater	Not encountered ATD			Logged By	B. Hasanzadeh
				Weather	60's - Clear

Scale, ft.	Elevation, ft.	Soil Symbol	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
			TOPSOIL, (2 inches)	0.2								
			CLAY, silty, brown, gray, gray brown, red brown, low to moderate plasticity, dry to slightly moist, (FILL), with trace to few crushed stone and organics			0.0 - 1.5	100	4-5-6	11			
2.5	767.5					1.5 - 3.0	100	9-4-4	8	15.9		
5.0	765.0					4.0 - 5.5	100	2-2-3	5	15.9		
				6.0								
			CLAY, silty, brown, orange brown, moderate plasticity, stiff to very stiff, moist to very moist, (CL)			6.5 - 8.0	94	3-4-5	9	29.6		
7.5	762.5											
			- with trace chert fragments below approximately 8.5 feet			9.0 - 10.5	100	8-9-10	19			
10.0	760.0											
				10.5								
			Boring Terminated									
12.5	757.5											
15.0	755.0											

Remarks: (a) Ground surface elevations estimated to +/- 1-foot from Google Earth Imagery dated 2/21/2020.

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BORING RECORD

Project Name	**Freeman Lake Park - City of Elizabethtown**	Boring No.	B-03
Location	**212 Freeman Lake Park Rd, Elizabethtown, KY 42701**	Project No.	61:2851
Client	**City of Elizabethtown, Kentucky**	Elevation	767 (a)
Driller	M. Reynolds — Rig Type Geo-Probe 7700 (Truck-mounted)	Started	9/28/2022
Drill Method	Direct Push — Hammer Type Automatic	Completed	9/28/2022
Groundwater	Not encountered ATD	Logged By	B. Hasanzadeh
		Weather	60's - Clear

Scale, ft.	Elevation, ft.	Soil Symbol	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
			TOPSOIL, (1-inch)	0.1								
			CLAY, silty, brown, gray brown, low to moderate plasticity, dry, (FILL), with trace to few crushed stone and organics			0.0 - 1.5	100	7-10-11	21	10.7		
	765.0			2.0								
2.5			CLAY, silty, red brown, orange brown, brown, moderate plasticity, very stiff to hard, slightly moist to moist, (CL), with trace to few black oxide nodules and trace to little chert fragments			1.5 - 3.0	100	10-7-3	10	16.8		
	762.5											
5.0						4.0 - 5.5	100	4-5-8	13			
	760.0											
7.5						6.5 - 8.0	100	6-8-9	17			
	757.5											
10.0						9.0 - 10.5	100	12-13-13	26			
				10.5								
			Boring Terminated									
	755.0											
12.5												
	752.5											
15.0												

Remarks: (a) Ground surface elevations estimated to +/- 1-foot from Google Earth Imagery dated 2/21/2020.

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BORING RECORD

Project Name	**Freeman Lake Park - City of Elizabethtown**	Boring No.	B-04
Location	**212 Freeman Lake Park Rd, Elizabethtown, KY 42701**	Project No.	61:2851
Client	**City of Elizabethtown, Kentucky**	Elevation	764 (a)
Driller	M. Reynolds — Rig Type Geo-Probe 7700 (Truck-mounted)	Started	9/28/2022
Drill Method	Direct Push — Hammer Type Automatic	Completed	9/28/2022
Groundwater	Not encountered ATD	Logged By	B. Hasanzadeh
		Weather	60's - Clear

Scale, ft.	Elevation, ft.	Soil Symbol	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
			TOPSOIL, (1-inch)	0.1								
	762.5		CLAY, silty, brown, orange brown, red brown, low to moderate plasticity, dry, (FILL), with few crushed stone			0.0 - 1.5	100	9-13-11	24	11.3		
2.5						1.5 - 3.0	94	10-8-5	13			
				3.0								
	760.0		CLAY, silty, red brown, orange brown, tan mottling, moderate plasticity, very stiff to hard, slightly moist to moist, (CL), with few to little black oxide nodules and few to some chert fragments									
5.0						4.0 - 5.5	100	8-10-11	21	21.3		
	757.5											
7.5						6.5 - 8.0	100	9-9-9	18			
	755.0											
10.0						9.0 - 10.5	100	7-7-7	14			
				10.5								
			Boring Terminated									
	752.5											
12.5												
	750.0											
15.0												

Remarks: (a) Ground surface elevations estimated to +/- 1-foot from Google Earth Imagery dated 2/21/2020.

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BORING RECORD

Project Name	**Freeman Lake Park - City of Elizabethtown**			Boring No.	B-05
Location	**212 Freeman Lake Park Rd, Elizabethtown, KY 42701**			Project No.	61:2851
Client	**City of Elizabethtown, Kentucky**			Elevation	761 (a)
Driller	M. Reynolds	Rig Type	Geo-Probe 7700 (Truck-mounted)	Started	9/28/2022
Drill Method	Direct Push	Hammer Type	Automatic	Completed	9/28/2022
Groundwater	Not encountered ATD			Logged By	B. Hasanzadeh
				Weather	60's - Clear

Scale, ft.	Elevation, ft.	Soil Symbol	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
			TOPSOIL, (1-inch)	0.1								
	760.0		CLAY, silty, brown, gray brown, low to moderate plasticity, dry, (FILL), with little to mostly crushed stone			0.0 - 1.5	100	10-10-10	20			
						1.5 - 1.7	100	50/2"	50/2"	9.3		
2.5												
				3.0								
	757.5		CLAY, silty, brown, red brown, orange brown, moderate plasticity, stiff to hard, moist, (CL), with few black oxide nodules									
5.0						4.0 - 5.5	100	3-2-5	7	20.0		
	755.0											
7.5						6.5 - 8.0	100	5-5-8	13			
	752.5											
10.0						9.0 - 10.5	100	13-12-13	25			
				10.5								
	750.0		Boring Terminated									
12.5												
	747.5											
15.0												

Remarks: (a) Ground surface elevations estimated to +/- 1-foot from Google Earth Imagery dated 2/21/2020.

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BORING RECORD

Project Name	**Freeman Lake Park - City of Elizabethtown**	Boring No.	B-06
Location	**212 Freeman Lake Park Rd, Elizabethtown, KY 42701**	Project No.	61:2851
Client	**City of Elizabethtown, Kentucky**	Elevation	760 (a)
Driller	M. Reynolds — Rig Type Geo-Probe 7700 (Truck-mounted)	Started	9/28/2022
Drill Method	Direct Push — Hammer Type Automatic	Completed	9/28/2022
Groundwater	Not encountered ATD	Logged By	B. Hasanzadeh
		Weather	60's - Clear

Scale, ft.	Elevation, ft.	Soil Symbol	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
			TOPSOIL, (3 inches)	0.3								
			CLAY, silty, brown, tan brown, gray brown, red brown, low to moderate plasticity, dry, (FILL), with trace chert and crushed stone			0.0 - 1.5	94	9-9-7	16	10.8		
				2.5		1.5 - 3.0	94	8-8-7	15			
			CLAY, silty, red brown, orange brown, moderate plasticity, stiff to very stiff, slightly moist to moist, (CL), with few black oxide nodules and trace to some chert fragments									
5	755					4.0 - 5.5	100	7-7-8	15	17.6		Liquid Limit: 43 Plastic Limit: 22 Plasticity Index: 21
						6.5 - 8.0	100	9-10-9	19	21.6		
10	750					9.0 - 10.5	100	8-5-5	10			
			- moist to very moist below approximately 14 feet									
15	745					14.0 - 15.5	72	4-4-4	8			
				16.5								
			Boring Terminated at Direct Push Refusal									
20	740											

Remarks: (a) Ground surface elevations estimated to +/- 1-foot from Google Earth Imagery dated 2/21/2020.

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BORING RECORD

Project Name	**Freeman Lake Park - City of Elizabethtown**	Boring No.	B-07
Location	**212 Freeman Lake Park Rd, Elizabethtown, KY 42701**	Project No.	61:2851
Client	**City of Elizabethtown, Kentucky**	Elevation	757 (a)
Driller	M. Reynolds — Rig Type Geo-Probe 7700 (Truck-mounted)	Started	9/28/2022
Drill Method	Direct Push — Hammer Type Automatic	Completed	9/28/2022
Groundwater	Not encountered ATD	Logged By	B. Hasanzadeh
		Weather	60's - Clear

Scale, ft.	Elevation, ft.	Soil Symbol	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
			TOPSOIL, (3 inches)	0.3								
	755		CLAY, silty, brown, gray brown, red brown, low to moderate plasticity, dry to slightly moist, (FILL), with trace organics			0.0 - 1.5	100	4-4-3	7	12.8		
				2.5		1.5 - 3.0	94	4-4-5	9	13.8		
5			CLAY, silty, red brown, orange brown, moderate plasticity, stiff to hard, slightly moist to moist, (CL), with trace to few black oxide nodules and chert fragments			4.0 - 5.5	100	5-4-4	8	23.7		
	750					6.5 - 8.0	100	6-10-10	20			
10						9.0 - 10.5	100	12-12-16	28			
	745			14.0								
15			CLAY, silty, slightly sandy, brown, moderate plasticity, firm, moist to very moist, (CL), with trace black oxide nodules - with weathered rock below approximately 16 feet			14.0 - 15.5	94	4-1-3	4			
	740		Boring Terminated at Direct Push Refusal	16.3								
20												

Remarks: (a) Ground surface elevations estimated to +/- 1-foot from Google Earth Imagery dated 2/21/2020.

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BORING RECORD

Project Name	**Freeman Lake Park - City of Elizabethtown**	Boring No.	B-08
Location	**212 Freeman Lake Park Rd, Elizabethtown, KY 42701**	Project No.	61:2851
Client	**City of Elizabethtown, Kentucky**	Elevation	756 (a)
Driller	M. Reynolds — Rig Type Geo-Probe 7700 (Truck-mounted)	Started	9/28/2022
Drill Method	Direct Push — Hammer Type Automatic	Completed	9/28/2022
Groundwater	Not encountered ATD	Logged By	B. Hasanzadeh
		Weather	60's - Clear

Scale, ft.	Elevation, ft.	Soil Symbol	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
			TOPSOIL, (2 inches)	0.2								
	755		CLAY, silty, light brown, low to moderate plasticity, dry to slightly moist, (FILL), with trace black oxide nodules and trace to few organics			0.0 - 1.5	89	4-4-4	8	12.3		
						1.5 - 3.0	94	5-4-4	8	14.4		
				3.5								
5			CLAY, silty, orange brown with tan and gray mottling, moderate plasticity, slightly moist to moist, (POSSIBLE FILL), with few black oxide nodules and trace to few chert fragments			4.0 - 5.5	100	3-3-4	7	22.2		
	750			6.0								
			CLAY, silty, red brown, orange brown, moderate plasticity, very stiff to hard, slightly moist to moist, (CL), with few black oxide nodules and chert fragments			6.5 - 8.0	100	5-7-9	16	23.8		
10			- with little to some chert fragments below approximately 9 feet			9.0 - 10.5	72	9-13-13	26			
	745											
				14.0								
15			CLAY, silty, slightly sandy, brown, orange brown, light red brown, moderate plasticity, soft to firm, moist, (CL), with little to some black oxide nodules			14.0 - 15.5	100	3-2-1	3			
	740			16.7								
			Boring Terminated at Direct Push Refusal									
20												

Remarks: (a) Ground surface elevations estimated to +/- 1-foot from Google Earth Imagery dated 2/21/2020.

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BORING RECORD

Project Name	**Freeman Lake Park - City of Elizabethtown**	Boring No.	B-09
Location	**212 Freeman Lake Park Rd, Elizabethtown, KY 42701**	Project No.	61:2851
Client	**City of Elizabethtown, Kentucky**	Elevation	755 (a)
Driller	M. Reynolds — Rig Type Geo-Probe 7700 (Truck-mounted)	Started	9/28/2022
Drill Method	Direct Push — Hammer Type Automatic	Completed	9/28/2022
Groundwater	Not encountered ATD	Logged By	B. Hasanzadeh
		Weather	60's - Clear

Scale, ft.	Elevation, ft.	Soil Symbol	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
			TOPSOIL, (2 inches)	0.2								
			CLAY, silty, brown, low to moderate plasticity, dry, (FILL), with little to some crushed stone	1.8		0.0 - 1.5	83	6-5-7	12	9.5		
			CLAY, silty, brown to tan brown, low to moderate plasticity, stiff, moist to very moist, (CL), with few black oxide nodules			1.5 - 3.0	83	6-3-2	5	17.5		
5	750					4.0 - 5.5	100	3-2-3	5	31.9		Liquid Limit: 43 Plastic Limit: 19 Plasticity Index: 24
			CLAY, silty, red brown, orange brown, moderate plasticity, very stiff to hard, slightly moist to moist, (CL), with few black oxide nodules and trace to some chert fragments	6.0		6.5 - 8.0	100	3-4-7	11	21.2		
10	745					9.0 - 10.5	72	10-13-15	28			
			- with weathered rock below approximately 15 feet			14.0 - 15.3	100	3-7-50/3"	50/3"			
15	740			15.3								
			Boring Terminated at Direct Push Refusal									
20	735											

Remarks: (a) Ground surface elevations estimated to +/- 1-foot from Google Earth Imagery dated 2/21/2020.

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BORING RECORD

Project Name	**Freeman Lake Park - City of Elizabethtown**	Boring No.	B-10
Location	**212 Freeman Lake Park Rd, Elizabethtown, KY 42701**	Project No.	61:2851
Client	**City of Elizabethtown, Kentucky**	Elevation	766 (a)
Driller	M. Reynolds — Rig Type Geo-Probe 7700 (Truck-mounted)	Started	9/28/2022
Drill Method	Direct Push — Hammer Type Automatic	Completed	9/28/2022
Groundwater	Not encountered ATD	Logged By	B. Hasanzadeh
		Weather	60's - Clear

Scale, ft.	Elevation, ft.	Material Description and Classification	Depth, ft.	Sample Type	Sample Depth, ft.	Recovery, %	Standard Penetration Test Blows	N Value	Water Content, %	Uc, tsf	Comments
		ASPHALT, (5 inches)	0.4								
	765.0	GRAVEL, crushed stone, (FILL)	1.5								
2.5		CLAY, silty, brown to orange brown, low to moderate plasticity, stiff, slightly moist to moist, (CL), with trace black oxide nodules			1.5 - 3.0	100	3-3-3	6	18.2		
	762.5		3.5								
5.0		CLAY, silty, red brown, moderate plasticity, stiff to hard, slightly moist to moist, (CL), with trace to little black oxide nodules			4.0 - 5.5	100	4-3-4	7	21.2		
	760.0										
7.5					6.5 - 8.0	100	5-5-8	13			
	757.5	- with little to some chert fragments below approximately 8.5 feet									
10.0					9.0 - 10.5	100	10-10-10	20			
			10.5								
	755.0	Boring Terminated									
12.5											
	752.5										
15.0											

Remarks: (a) Ground surface elevations estimated to +/- 1-foot from Google Earth Imagery dated 2/21/2020.

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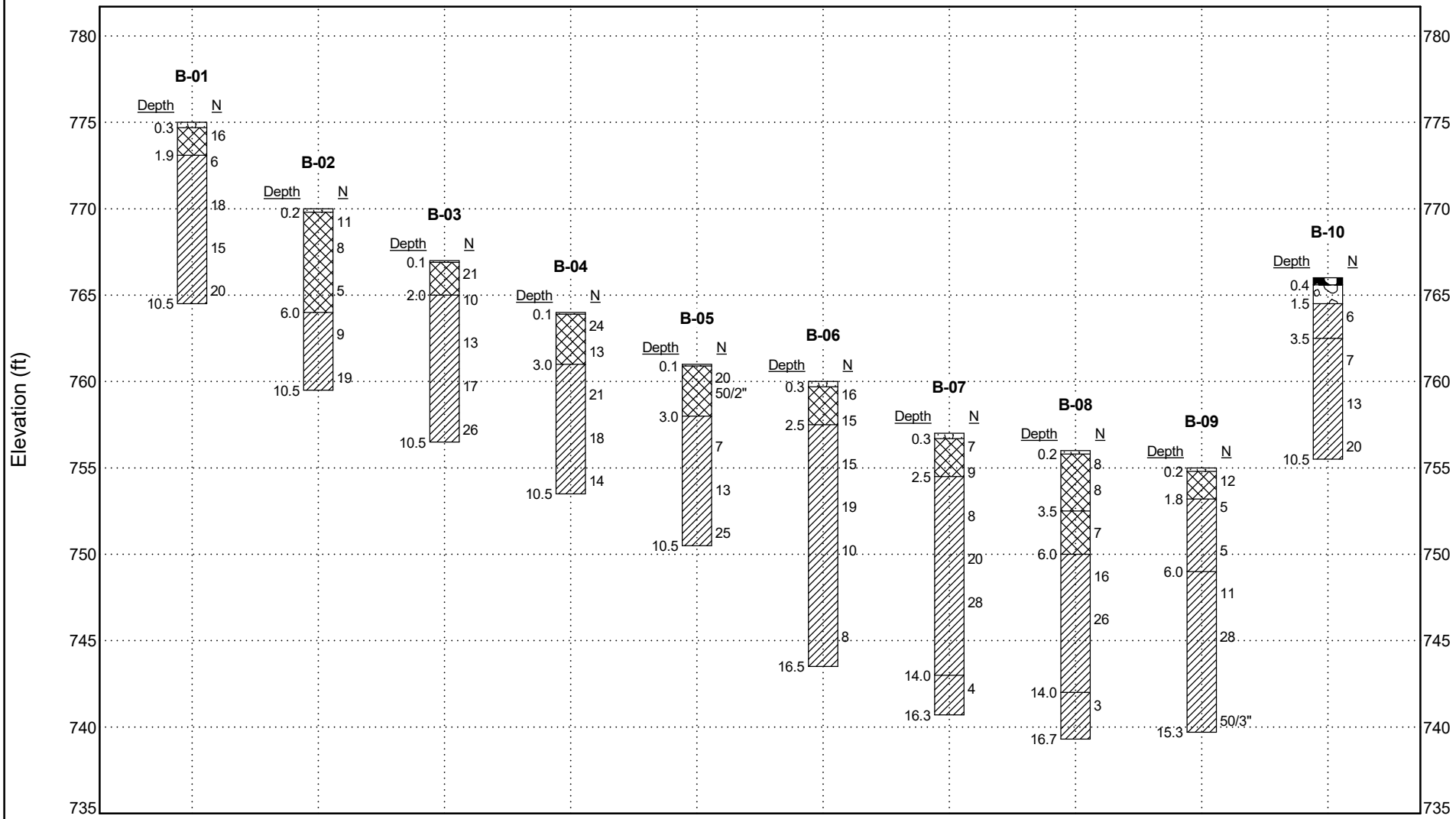
BORING COMPOSITE

CLIENT City of Elizabethtown, Kentucky

PROJECT NAME Freeman Lake Park - City of Elizabethtown

PROJECT NUMBER 61:2851

PROJECT LOCATION 212 Freeman Lake Park Rd, Elizabethtown, KY 4270



Remarks: Ground surface elevations estimated to +/- 1-foot from Google Earth Imagery dated 2/21/2020.

Field Procedures

General

ECS conducts field sampling and testing procedures in general accordance with methods of the American Society for Testing Materials (ASTM) and widely accepted geotechnical engineering standards. A brief description of the procedures we utilize is provided in the following paragraphs.

Soil Borings (ASTM D-1452)

Soil borings are made with hollow stem augers or continuous augers which are mechanically advanced by a powered drill rig. At selected depths, soil samples are obtained with either a split-barrel sampler or a thin wall tube sampler. Soil borings are advanced to refusal, or to maximum depths as defined in our scope of work. The boring data, including sampling intervals, penetration resistances, soil classifications, and groundwater observations, are presented on the attached Boring Records.

Boring Locations and Elevations

Boring locations typically are selected by our project manager. The project manager establishes the boring locations in the field by pacing or measuring distances and estimating angles relative to existing site landmarks. When topographic plans of the site are provided, the project manager estimates the surface elevation of the boring locations using available information. Surveying to determine the locations and elevations of the borings is beyond the scope of typical geotechnical studies; therefore, the boring locations and elevations should be considered approximate.

Standard Penetration Test (SPT) Split-Barrel Samples (ASTM D-1586)

A split-barrel or "splitspoon" is inserted into the borehole to obtain soil samples. The sampler is driven three, 6-inch increments with a 140-pound hammer falling from a height of 30 inches. The "standard penetration resistance" or "N-value" is the number of hammer blows required to drive the sampler the final 12 inches. The N-value, when properly evaluated, is an index of soil strength and/or density. Upon completion of each standard penetration test, the sampler is brought to the surface and the tube is opened to expose the recovered soil. Our project manager examines the sample, records the soil description and other pertinent information, and places a representative portion of the soil into a sealed container for transportation to our laboratory.

Water Level Readings

Water level readings are taken in each borehole upon the completion of drilling or excavation. In low permeability soils, such as silts and clays, the water level in the boreholes may take many hours to stabilize. Groundwater levels may be dependent upon recent rainfall activity and other site specific factors. Since these conditions may change with time, the water level information presented on the Boring Records represents the conditions only at the time each measurement was taken.

Boring Records

Our interpretation of the conditions encountered at each location is indicated on the Boring Records, which are prepared from the observations of the ECS field engineer or geologist during drilling or excavation, our engineering review of the soil samples obtained, the results of laboratory testing on selected samples, and our experience with similar subsurface conditions. Soil descriptions are made using the Unified Soil Classification System and/or ASTM D-2488 as guides. The depths designating strata changes are estimations and only representative of depths at that specific boring location. In many geologic settings, the transition between strata is gradual. A Boring Legend, which defines the symbols and other pertinent information presented on the Boring Records, is provided with this report. The subsurface conditions indicated on our Boring Records represent only the conditions encountered at the specific boring location at the time of our exploration. The groundwater

observations were made at the time of drilling and may vary with changes in the season and weather.

Refusal

Refusal is the term applied to material that cannot be penetrated with augers or has a standard penetration resistance exceeding 50 blows per 6-inch increment. Refusal may be encountered on continuous bedrock, discontinuous floaters, cemented soil, weathered rock, debris, buried structures, or other hard subsurface materials. Refusal materials can be evaluated only by obtaining a core of the material. This limitation must be considered when evaluating refusal depths where coring is not conducted.

Laboratory Procedures

General

Laboratory tests are generally conducted to satisfy one or more of the following objectives: (1) confirmation of visual-manual soil identification; (2) determination of index values used to estimate soil engineering properties (i.e., strength, compressibility and permeability); or (3) direct measurement of specific soil properties. The tests selected for a given project are dependent on the subsurface conditions encountered, as well as specific project requirements, such as structural loads and planned grade changes. The results of laboratory tests conducted for this project are listed on the Boring Records, Laboratory Test Data Summary, or laboratory data curves in the Appendix. Brief descriptions of the test procedures are provided below.

Description and Identification of Soils (Visual-Manual Procedure) (ASTM D 2488)

The Visual-Manual Procedure provides a general guide to the engineering properties of soils and enables the engineer to apply past experience to current situations. Samples obtained during the field exploration are examined and visually described and identified by a geotechnical engineer or geologist. The soils are typically identified according to predominant particle size (clay, silt, sand, etc.), consistency (based on apparent stiffness and the number of blows from standard penetration tests), color, moisture and group symbol (CL, CH, SP, SC, etc.). Unless otherwise indicated, the soil descriptions in this report are based on the Visual-Manual Procedure.

Classification of Soils for Engineering Purposes (Unified Soil Classification System) (ASTM D 2487)

The Visual-Manual Procedure described above is primarily qualitative. The Unified Soil Classification System (USCS) is used when precise soil classification is required. The USCS is based on laboratory determination of particle-size characteristics, liquid limit, and plasticity index. Using these test results, the soil can be classified according to the Unified Classification System, which provides an index for estimating soil behavior.

Water (Moisture) Content of Soil (ASTM D 2216)

Moisture content is one of the most important index properties used in establishing a correlation between soil behavior and soil properties such as strength and compressibility. The moisture content, along with the liquid and plastic limits, are used to express the relative consistency or liquidity index of a soil. Increasing moisture contents typically reflect lower strengths for a given soil. The soil moisture content is the ratio, expressed as a percentage, of the mass of “pore” or “free” water in a given mass of soil to the mass of the solid soil. Moisture content samples are taken from the sealed container obtained during the field exploration phase of a project. Each sample is weighed, and then placed in an oven set to 110^{o}C + 5^{o}. Each sample remains in the oven until the free moisture evaporates. Each dried sample is removed from the oven, allowed to cool, and then weighed. The moisture content is computed by dividing the weight of evaporated water by the weight of the dry sample.

Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D 4318)

Depending upon the relative moisture content, a fine-grained soil may occur in a liquid, plastic, or solid state. In current usage, the liquid limit (LL) and plastic limit (PL) of a soil are referred to as the “Atterberg Limits”, which establish the approximate moisture contents at which the soil changes state. This test method is an integral part of several engineering classification systems to characterize the fine grained fractions of soils. It is also used with other soil properties to correlate with engineering behavior such as compressibility, permeability, compactability, shrink-swell, and shear strength. The liquid limit is the moisture content at which a soil becomes sufficiently "wet" to behave as a heavy viscous fluid (i.e., transition from plastic to liquid state). It is defined as the moisture content at which the soil, when placed in a standard brass bowl, makes a 1/2-inch closure

in a groove cut through the soil after the bowl is dropped 25 times at a specified height and rate. The plastic limit is the moisture content at which the soil begins to lose its plasticity (i.e., transition from plastic to semi-solid state). It is defined as the lowest moisture content at which the soil can be rolled into 1/8-inch diameter threads without crumbling. The plasticity index (PI) is the difference between the liquid limit and the plastic limit, and is the range of moisture content over which a soil deforms as a plastic material.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes:

   A. Project Information.
   B. Work covered by Contract Documents.
   C. Phased Construction.
   D. Work performed by Owner.
   E. Owner-furnished/Contractor-installed (OFCI) products.
   F. Contractor’s use of Site and Premises.
   G. Coordination with Occupants.
   H. Work Restrictions.
   I. Specification and Drawing conventions.

2. Related Requirements:

   A. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
   B. Division 01 Section “Construction Progress Documentation” for administrative and procedural requirements for Contractor’s construction schedule.
   C. Division 01 Section “Closeout Procedures” for administrative and procedural requirements for contract closeout.

1.2 PROJECT INFORMATION

1. Project Identification: Elizabethtown Freeman Lake Park – Shelters Project.

2. Project Location: Freeman Lake Park .Freeman Lake Park Road. Elizabethtown, Kentucky.

3. Owner: City of Elizabethtown. 200 West Dixie Avenue. Elizabethtown, Kentucky 42701.

   A. Owner's Representative: Jason Dailey

4. Architect: CMW, Inc., 249 East Main Street, Suite 100, Lexington, Kentucky 40507

   A. Architect's Representative: Brad Boaz

5. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:
   A. Structural: ICON Engineering and Inspection Services, PLLC, 35 Public Square, Elizabethtown, KY 42701.

   B. Mechanical / Electrical: E-Tech Consultants. 378 Park Avenue, Lexington, KY 40502.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

1. The Work of Project is defined by the Contract Documents and consists of the following:
   A. This Project is located within Freeman Lake Park near Freeman Lake Park Road in Elizabethtown, KY. The Project consists of the construction of a Restroom Building with Open-Air Shelter and second Restroom Building with indicated site improvements.

2. Type of Contract.

   A. Project will be constructed under a single prime contract.

   B. PROJECT CONTRACT CLOSEOUT:

      a. Project Contract Close-Out shall be completed within 30 calendar days after Substantial Completion.

         1) Refer to Section 017700 “Closeout Procedures” for administrative and procedural requirements for contract closeout.

      b. The Contractor’s General Warranty specified in the Contract shall commence on the date as stipulated in the Contract.

3. Contractor's Construction Schedule: Before commencing Work, submit an updated copy of Contractor's construction schedule, showing the sequence, commencement and Substantial Completion dates and the Final Completion date.

   A. Refer to Section 013200 “Construction Progress Documentation” for administrative and procedural requirements for Contractor’s construction schedule.

1.4 CONTRACTOR'S USE OF SITE AND PREMISES

1. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings and as indicated by requirements of this Section.

2. Limits on Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

    A. Limits: Confine construction operations Work limits as indicated by requirements of this Section.
    B. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to the Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

        a. Freeman Lake Park Road and associated Parking Lot shall be kept free of construction debris and maintained throughout the course of construction.
        b. Schedule deliveries to minimize use of driveways and entrances by construction operations.
        c. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

3. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.5 COORDINATION WITH OCCUPANTS

1. Full Owner Occupancy: Owner will occupy Project site and adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

    A. Maintain access to existing sidewalks, and other adjacent occupied or used facilities. Do not close or obstruct sidewalks, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
    B. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

2. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such placement of

equipment does not interfere with completion of the Work. Such placement of equipment shall not constitute acceptance of the total Work.

1.6 WORK RESTRICTIONS

1. Work Restrictions, General: Comply with restrictions on construction operations.

   A. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

2. On-Site Work Hours:

   A. Working hours on site is limited to: No specific date or time work restrictions.

3. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

   A. Notify Owner not less than two days in advance of proposed utility interruptions.
   B. Obtain Owner's written permission before proceeding with utility interruptions.

4. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.

   A. Notify Owner not less than two days in advance of proposed disruptive operations.
   B. Obtain Owner's written permission before proceeding with disruptive operations.

5. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

6. Controlled Substances: Use of controlled substances on Project site is not permitted.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

1. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

A. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
B. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

2. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

3. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

A. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Requirements:

1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.2 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.

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes**,** overhead, and profit.

B. 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.

C. List of Unit Prices: A schedule of required unit prices is included in this manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012200

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

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. See Construction Drawing Cover Sheet
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 General 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.

1.4 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.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

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 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.2 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, using Architect standard form.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Request For Proposal (RFP): 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. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request 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 Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Work Change 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. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. 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. If requested, furnish survey data to substantiate quantities.
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.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Work Change Proposal Request Form: Use form acceptable to Architect.

1.4 ADMINISTRATIVE CHANGE ORDERS

A. Unit-Price Adjustment: See Division 01 Section "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor using Owner’s standard form.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive using Architect’s standard form. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Prepare Schedule of Values for each Coordinate line items in the schedule of values with 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 14 days before the date scheduled for submittal of initial Applications for Payment.

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. Arrange schedule of values consistent with format of AIA Document G703.
2. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
3. 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.

4. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.
5. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.3 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.

B. Payment Application Times: Submit Application for Payment in accordance with the Contract between the Owner and Contractor. If a monthly partial payment is agreed upon, the period covered by each Application for Payment shall be one month, ending on the last day of the month.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 or approved equal 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.

E. Transmittal: Submit three signed and notarized original copies of each Application for Payment to the Architect. 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.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from the General Contractor, 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 provided by and acceptable to Owner.

G. 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.
4. Submittal schedule (preliminary if not final).
5. List of Contractor's staff assignments.
6. List of Contractor's principal consultants.
7. Copies of building permits.
8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
9. Certificates of insurance and insurance policies.
10. Performance and payment bonds.
11. Data needed to acquire Owner's insurance.

H. 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.

I. 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.
5. AIA Document G706A.
6. AIA Document G707.
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. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Project meetings.

B. Related Requirements:

1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.3 DEFINITIONS

A. RFI: Request for Information. 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, telephone number, and email address of entity performing subcontract or supplying products.

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. 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. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.6 COORDINATION DRAWINGS – CONTRACTOR USE ONLY

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
e. Indicate required installation sequences.
f. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

1.7 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
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.

C. RFI Forms: Form bound in Project Manual.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow ten 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 by Architect 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 five 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 with not less than 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 five days if Contractor disagrees with response.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Digital Drawing Software Program: Contract Drawings are available in AutoCAD 2018.
4. Contractor shall execute a data licensing and release agreement in the form of an Agreement form acceptable to Owner and Architect.

    a. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of an Agreement acceptable to Owner and Architect.

B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare 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.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

A. General: General Contractor will schedule and conduct progress meetings and conferences at Project site unless otherwise indicated.

B. Preconstruction Conference: Architect will 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. Attendees: Authorized representatives of Owner, 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.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Responsibilities and personnel assignments.
b. Tentative construction schedule.
c. Phasing.
d. Critical work sequencing and long lead items.
e. Designation of key personnel and their duties.
f. Lines of communications.
g. Procedures for processing field decisions and Change Orders.
h. Procedures for RFIs.
i. Procedures for testing and inspecting.
j. Procedures for processing Applications for Payment.
k. Distribution of the Contract Documents.
l. Submittal procedures.
m. Preparation of Record Documents.
n. Use of the premises.
o. Work restrictions.
p. Working hours.
q. Owner's occupancy requirements.
r. Responsibility for temporary facilities and controls.
s. Procedures for moisture and mold control.
t. Procedures for disruptions and shutdowns.
u. Construction waste management and recycling.
v. Parking availability.
w. Office, work, and storage areas.
x. Equipment deliveries and priorities.
y. First aid.
z. Security.
aa. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for 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 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. Contract Documents.
b. Options.
c. Related RFIs.

d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Sustainable design requirements.
i. Review of mockups.
j. Possible conflicts.
k. Compatibility requirements.
l. Time schedules.
m. Weather limitations.
n. Manufacturer's written instructions.
o. Warranty requirements.
p. Compatibility of materials.
q. Acceptability of substrates.
r. Temporary facilities and controls.
s. Space and access limitations.
t. Regulations of authorities having jurisdiction.
u. Testing and inspecting requirements.
v. Installation procedures.
w. Coordination with other work.
x. Required performance results.
y. Protection of adjacent work.
z. Protection of construction and personnel.

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. Owner reserves the right to increase the frequency of progress meetings.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner 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) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site use.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of Proposal Requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

4. Minutes: Contractor 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 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Construction schedule updating reports.
3. Daily construction reports.
4. Site condition reports.

1.2 INFORMATIONAL SUBMITTALS

A. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

B. Construction Schedule Updating Reports: Submit with Applications for Payment.

C. Daily Construction Reports: Submit at monthly intervals

D. Site Condition Reports: Submit at time of discovery of differing conditions.

1.3 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. As a minimum, submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice to Proceed.

1. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion and 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.

C. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

D. 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.

2.2 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Partial completions and occupancies.
18. Substantial Completions authorized.

B. 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.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. 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.

B. Distribution: Distribute copies of approved schedule to Architect Owner, 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 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Final completion construction photographs.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
2. Section 311000 "Site Clearing" for photographic documentation before site clearing operations commence.

1.2 INFORMATIONAL SUBMITTALS

A. Digital Photographs: Submit image files within three days of taking photographs.

1. Submit photos by uploading to web-based file sharing site. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description:

a. Name of Project.
b. Name and contact information for photographer.
c. Name of Contractor.
d. Date photograph was taken.
e. Description of location, vantage point, and direction.
f. Unique sequential identifier keyed to accompanying key plan.

1.3 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a photographer of construction projects for not less than two years.

1.4 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.

B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

C. File Names: Name media files with date, project, and sequential numbering suffix.

1.5 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.

B. General: Take photographs with maximum depth of field and in focus.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Preconstruction Photographs: Before starting construction take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.

1. Flag construction limits before taking construction photographs.
2. Take photographs to show existing conditions adjacent to property before starting the Work.
3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Periodic Construction Photographs: Take photographs coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

E. Final Completion Construction Photographs: Take photographs after date of Substantial Completion for submission as Project Record Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

1.2 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."

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list 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.

1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.

7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
8. Category and type of submittal.
9. Submittal purpose and description.
10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.
13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.
16. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Paper Submittals:

1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
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. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using AIA Document G810 transmittal form or approved equal.

E. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package, and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
2. Paper: Prepare submittals in paper form, and deliver to Architect.

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.

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. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

E. 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.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.6 SUBMITTAL REQUIREMENTS

A. 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 unsuitable 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 catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.

B. 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. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 24 by 36 inches.

a. Two opaque (bond) copies of each submittal. Architect will return one copy.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

a. Project name and submittal number.
b. Generic description of Sample.
c. Product name and name of manufacturer.
d. Sample source.
e. Number and title of applicable Specification Section.
f. Specification paragraph number and generic name of each item.

3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
4. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
5. 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 that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

7. 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 two sets of Samples. Architect will retain one Sample sets; remainder will be returned.

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.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

E. 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.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit 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. Provide a notarized signature where indicated.
2. 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.
3. 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.

4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. 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.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.

f. Test procedures and results.
g. Limitations of use.

1.7 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit a digitally signed PDF file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.8 CONTRACTOR'S REVIEW

A. Action Submittals 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. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include 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.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.

2. Paper Submittals: Architect will provide a cover sheet to each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. 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.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Architect will discard submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection 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. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described 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.

B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. 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, assembly, 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).

D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to

demonstrate aesthetic effects and 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. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as **freestanding temporary built elements** consisting of multiple products, assemblies, and subassemblies.

E. 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.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. 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.

J. 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. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.3 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1.4 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements 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 direction 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 ACTION SUBMITTALS

A. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

B. 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.

C. Permits, Licenses, and Certificates: For Owner's record, 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.

1.7 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, telephone number, and email address 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 inspection.
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. Statement on condition of substrates and their acceptability for installation of product.
2. Statement that products at Project site comply with requirements.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. 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. Statement that equipment complies with requirements.
2. Results of operational and other tests and a statement of whether observed performance complies with requirements.
3. Other required items indicated in individual Specification Sections.

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. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

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, applying, 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 inspection 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.

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.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
8. Demolish and remove mockups when directed unless otherwise indicated.

L. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

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 inspection 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, whether specified or not, to verify and document that the Work complies with requirements.

1. Engage a qualified testing agency to perform quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspection will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. 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.

D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations 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 duties of Contractor.

E. 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."

F. 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.

G. Associated Contractor Services: Cooperate with agencies and representatives 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 inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
6. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

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 reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, 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 014200 - REFERENCES

PART 1 - GENERAL

1.1 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.

1.2 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.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 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 indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. 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.

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. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.abma.com.
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.

14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; http://www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.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 and 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; (See ECIA).
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
73. ECIA - Electronic Components Industry Association; www.eciaonline.org.
74. EIA - Electronic Industries Alliance; (See TIA).
75. EIMA - EIFS Industry Members Association; www.eima.com.
76. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
77. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
78. ESTA - Entertainment Services and Technology Association; (See PLASA).
79. EVO - Efficiency Valuation Organization; www.evo-world.org.
80. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
81. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
82. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
83. FM Approvals - FM Approvals LLC; www.fmglobal.com.

84. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
85. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
86. FSA - Fluid Sealing Association; www.fluidsealing.com.
87. FSC - Forest Stewardship Council U.S.; www.fscus.org.
88. GA - Gypsum Association; www.gypsum.org.
89. GANA - Glass Association of North America; www.glasswebsite.com.
90. GS - Green Seal; www.greenseal.org.
91. HI - Hydraulic Institute; www.pumps.org.
92. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
93. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
94. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
95. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
96. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
97. IAS - International Accreditation Service; www.iasonline.org.
98. IAS - International Approval Services; (See CSA).
99. ICBO - International Conference of Building Officials; (See ICC).
100. ICC - International Code Council; www.iccsafe.org.
101. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
102. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
103. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
104. IEC - International Electrotechnical Commission; www.iec.ch.
105. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
106. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
107. IESNA - Illuminating Engineering Society of North America; (See IES).
108. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
109. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
110. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
111. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
112. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
113. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
114. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
115. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
116. ISO - International Organization for Standardization; www.iso.org.
117. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
118. ITU - International Telecommunication Union; www.itu.int/home.
119. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.

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.mhia.org.
128. MMPA - 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. NBI - New Buildings Institute; www.newbuildings.org.
137. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
138. NCMA - National Concrete Masonry Association; www.ncma.org.
139. NEBB - National Environmental Balancing Bureau; www.nebb.org.
140. NECA - National Electrical Contractors Association; www.necanet.org.
141. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
142. NEMA - National Electrical Manufacturers Association; www.nema.org.
143. NETA - InterNational Electrical Testing Association; www.netaworld.org.
144. NFHS - National Federation of State High School Associations; www.nfhs.org.
145. NFPA - National Fire Protection Association; www.nfpa.org.
146. NFPA - NFPA International; (See NFPA).
147. NFRC - National Fenestration Rating Council; www.nfrc.org.
148. NHLA - National Hardwood Lumber Association; www.nhla.com.
149. NLGA - National Lumber Grades Authority; www.nlga.org.
150. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
151. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
152. NRCA - National Roofing Contractors Association; www.nrca.net.
153. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
154. NSF - NSF International; www.nsf.org.
155. NSPE - National Society of Professional Engineers; www.nspe.org.

156. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
157. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
158. NWFA - National Wood Flooring Association; www.nwfa.org.
159. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
160. PDI - Plumbing & Drainage Institute; www.pdionline.org.
161. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
162. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
163. RFCI - Resilient Floor Covering Institute; www.rfci.com.
164. RIS - Redwood Inspection Service; www.redwoodinspection.com.
165. SAE - SAE International; www.sae.org.
166. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
167. SDI - Steel Deck Institute; www.sdi.org.
168. SDI - Steel Door Institute; www.steeldoor.org.
169. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
170. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
171. SIA - Security Industry Association; www.siaonline.org.
172. SJI - Steel Joist Institute; www.steeljoist.org.
173. SMA - Screen Manufacturers Association; www.smainfo.org.
174. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
175. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
176. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
177. SPIB - Southern Pine Inspection Bureau; www.spib.org.
178. SPRI - Single Ply Roofing Industry; www.spri.org.
179. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
180. SSINA - Specialty Steel Industry of North America; www.ssina.com.
181. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
182. STI - Steel Tank Institute; www.steeltank.com.
183. SWI - Steel Window Institute; www.steelwindows.com.
184. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
185. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
186. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
187. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
188. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
189. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
190. TMS - The Masonry Society; www.masonrysociety.org.

191. TPI - Truss Plate Institute; www.tpinst.org.
192. TPI - Turfgrass Producers International; www.turfgrasssod.org.
193. TRI - Tile Roofing Institute; www.tileroofing.org.
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; www.wicnet.org.
204. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
205. WWPA - Western Wood Products Association; www.wwpa.org.

C. 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.

1. KBC – Kentucky Building Code
2. ICC - International Code Council; www.iccsafe.org.
3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. 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.

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; www.quicksearch.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/fdsys.
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; www.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; The National Academies; 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. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

E. 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.

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 DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.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).

F. 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.

1. HBC-DBCE – Kentucky Housing, Buildings and Construction, Division of Building Codes Enforcement.

PART 2 - DUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 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.

1.2 USE CHARGES

A. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without payment by Contractor for use charges. Contractor to provide connections and extensions of services as required for construction operations.

B. Electric Power Service: Contractor may install temporary power from the existing overhead power service. Contractor to pay for use charges and remove temporary power facilities prior to Substantial Completion.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Erosion and Sedimentation-Control Plan: Contractor shall obtain an Erosion Prevention and Sediment Control Permit from the City of Elizabethtown Stormwater Management Department. Contractor must show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent

C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

E. Moisture-and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold.

F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste-handling procedures.
5. Other dust-control measures.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 15 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and and marker boards.
3. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
4. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures."

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

2.3 TEMPORARY TOILETS, FACILITIES

A. Provide adequate temporary toilet and hand washing facilities for use by all employees conforming to all applicable laws, ordinances, and regulations. Maintain these facilities in sanitary condition and remove upon completion of work.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities 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.

3.2 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.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. 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.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Contractor to install temporary electric power service overhead unless otherwise indicated.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. 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.
3. Waterworks Drive to have a single lane open at all times.

D. Parking: Provide temporary parking areas for construction personnel. Do not use existing Park Office parking lots for Construction traffic or parking.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Signs: Provide Project Identification Sign for display along US-62. Unauthorized signs are not permitted.

1. Identification Sign: Provide weather resistant full color 4’-0” x 8’-0” project identification sign on exterior plywood with edge trim and wood supports. Template to be provided by Architect. Locate sign to be visible to Freeman Lake Park Road and as directed by Owner.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

    a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs so they are legible at all times.

G. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

I. 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.

3.5 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.

A. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Division 31 Section "Site Clearing."

A. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

B. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

C. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

D. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

E. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

G. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

H. 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.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

I. 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; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.

2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

B. Exposed Construction Period: 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.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

3.7 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.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion as applicable to each Phase.

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 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 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 012500 "Substitution Procedures" for requests for substitutions.

1.2 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 by Architect 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 single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design 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 seven days 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 Architect's Approval of Submittal: 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.

1.4 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.

1.5 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.

1.6 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. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

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 meeting 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.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: …"

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: …"

3. Limited List of Products: 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 not be considered unless otherwise indicated.

a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: …"

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.

   a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: …"

5. Limited List of Manufacturers: 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 not be considered unless otherwise indicated.

   a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: …"

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.

   a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: …"

7. 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.

   a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

C. Visual Matching Specification: Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches

Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: 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 proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
2. Evidence that proposed product provides specified warranty.
3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
4. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 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. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.2 INFORMATIONAL SUBMITTALS

A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

1.3 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. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural

elements in a manner that could change their load-carrying capacity or increase deflection.

2. 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.
3. 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.
4. 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. 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. 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, 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. 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 local utility 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. 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.

B. 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.

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.

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: Where possible, select tools or equipment that minimize production of excessive 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 portions of the 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. Remove and replace damaged, defective, or non-conforming Work.

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. 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 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.
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 017419 "Construction Waste Management and Disposal."

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 ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 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."

3.9 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. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Recycling nonhazardous demolition and construction waste.
2. Disposing of nonhazardous demolition and construction waste.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification and waste reduction work plan. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.3 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 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. Submittal of Warranties.
4. Cleaning at Substantial Completion and at Final Completion.
5. Repair of the Work.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for requirements for application for payment at Substantial Completion and Final Completion..
2. Section 017823 "Operation and Maintenance Data" for additional 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 to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.2 SUBSTANTIAL COMPLETION PROCEDURES

A. When the Contractor considers that the Work 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.

1. Contractor's List of Incomplete Items: Contractor to 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.
2. Upon receipt of the Contractor’s list, the Architect and Owner will conduct a review of the Work to determine whether the Work is substantially complete.

a. If the Architect and Owner's review 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 for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item. In such case, the Contractor shall then submit a request for another review by the Architect to determine Substantial Completion.

1) The cost of additional reviews conducted by the Architect that are charged to the Owner as a result the Contractor's work found to not be sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use, shall be charged to the Contractor by the Owner.

3. When the Work is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate.

a. Warranties required by the Contract Documents for the Work shall commence on the date of Substantial Completion unless otherwise provided in the Certificate of Substantial Completion.

4. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting a review of the Work 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, 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 maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
5. Submit testing, adjusting, and balancing records.
6. 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. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. 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."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Review of the Work: Submit a written request for a review of the Work to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for review and tests. On receipt of request, Architect will either proceed with a review of the Work or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after a review of the Work has been conducted or will notify Contractor of items, either on Contractor's list or additional items identified by Architect and Owner, that must be completed or corrected before certificate will be issued.

1.3 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final review of the Work for determining final completion of the Project, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items (Contractor Punch List): Submit certified copy of Architect's Substantial Completion review lists of items to be completed or corrected (Contractor Punch List), endorsed and dated by Architect. Certified copy of 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.
4. Submit pest-control final inspection report as applicable.

B. Review of the Work for Final Completion: Submit a written request for a final review to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final review and tests. On receipt of request, Architect will either proceed with a review or notify the Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after review or will notify the Contractor of construction that must be completed or corrected before certificate will be issued.

1.4 LIST OF INCOMPLETE ITEMS (CONTRACTOR 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.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Submit list of incomplete items in the following format:

    a. PDF electronic file. Architect will return annotated file.

1.5 SUBMITTAL OF WARRANTIES

A. Time of Submittal: Submit written warranties for the Work where warranties are indicated to commence on the date of Substantial Completion. Any delay in submittal of warranties shall not limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single

electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit on digital media acceptable to Architect.

D. Warranties in Paper Form:

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 paper.

E. 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 CLEANING AT SUBSTANTIAL COMPLETION AND AT FINAL COMPLETION

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 review for certification of Substantial Completion and Final Completion:

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. 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.

c. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
d. Sweep concrete floors broom clean in unoccupied spaces.
e. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
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 light fixtures, lamps, globes, and reflectors to function with full efficiency.
i. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations, before requesting review for determination of Substantial Completion.

B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved 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 operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit three paper 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.

D. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.3 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
2. 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.

1.4 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: 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.
6. Name and contact information for Architect.
7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
8. Cross-reference to related systems in other operation and maintenance manuals.

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.

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. 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."

1.5 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.6 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

B. 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.

C. 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. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. 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.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.7 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

B. 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 warranties and bonds, as described below.

C. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; 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.

    a. 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.

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.

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. 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.

H. 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.

1.8 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. 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.

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. Schedule for routine cleaning and maintenance.
5. 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Requirements:

1. Section 017300 "Execution" for final property survey.
2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one 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.

1.3 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. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Details not on the original Contract Drawings.
    l. Field records for variable and concealed conditions.
    m. Record information on the Work that is shown only schematically.

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 Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

1.4 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as marked paper copy.

1.5 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 marked paper copy.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.6 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as paper copy.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 2 - EXECUTION

2.1 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/Engineer reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and 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.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

1.3 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

1.4 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. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.5 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 have been reviewed and approved by Architect.

1.6 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. Systems and equipment operation manuals.
c. Systems and equipment maintenance manuals.
d. Product maintenance manuals.
e. Project Record Documents.
f. Identification systems.
g. Warranties and bonds.
h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. 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.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.

b. Test and inspection procedures.

7. 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.

8. 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.

1.7 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.

1.8 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

B. 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 with at least seven days' advance notice.

C. 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.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

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 033000 - CAST-IN-PLACE CONCRETE

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. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.
4. Suspended slabs.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Qualification Data: For Installer, manufacturer.

E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

F. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Semirigid joint filler.
12. Joint-filler strips.
13. Repair materials.

G. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

H. Field quality-control test and inspection reports.

I. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," [Sections 1 through 5.][Sections 1 through 5 and Section 7, "Lightweight Concrete."]
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

E. Concrete Testing Service: Material testing will be provided by the owner.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, vapor-retarder installation, anchor rod and anchorage device installation tolerances,]steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

    a. High-density overlay, Class 1 or better.
    b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
    c. Structural 1, B-B or better; mill oiled and edge sealed.
    d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. 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.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars.

D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

E. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:

a. Fly Ash: ASTM C 618, Class [C] [F].
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Lightweight Aggregate: ASTM C 330, 1/2-inch nominal maximum aggregate size.

E. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

1. Available Products:

a. Boral Material Technologies, Inc.; Boral BCN.
b. Euclid Chemical Company (The); Eucon CIA.
c. Grace Construction Products, W. R. Grace & Co.; DCI.
d. Master Builders, Inc.; Rheocrete CNI.
e. Sika Corporation; Sika CNI.

D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Available Products:

a. Axim Concrete Technologies; Catexol 1000CI.
b. Boral Material Technologies, Inc.; Boral BCN2.
c. Cortec Corporation; MCI 2000 or 2005NS.
d. Grace Construction Products, W. R. Grace & Co.; DCI-S.
e. Master Builders, Inc.; Rheocrete 222+.
f. Sika Corporation; FerroGard-901.

E. Plastic Vapor Retarder: ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

1. Available Products:

a. Fortifiber Corporation; Moistop Plus.
b. Raven Industries Inc.; Dura Skrim 8.
c. Reef Industries, Inc.; Griffolyn Type-65

d. Stego Industries, LLC; Stego Wrap, 10 mils.

F. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

G. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.7 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Water: Potable.

C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Available Products:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. Burke by Edoco; Aqua Resin Cure.
c. ChemMasters; Safe-Cure Clear.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
f. Euclid Chemical Company (The); Kurez DR VOX.
g. Kaufman Products, Inc.; Thinfilm 420.
h. Lambert Corporation; Aqua Kure-Clear.
i. L&M Construction Chemicals, Inc.; L&M Cure R.
j. Meadows, W. R., Inc.; 1100 Clear.
k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
m. Tamms Industries, Inc.; Horncure WB 30.
n. Unitex; Hydro Cure 309.
o. US Mix Products Company; US Spec Maxcure Resin Clear.
p. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.9 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. Silica Fume: 10 percent.
6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Normal-weight Concrete:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

B. Foundation Walls: Normal-weight Concrete:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Slump Limit: 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

C. Slabs-on-Grade: Normal-weight Concrete:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Minimum Cementitious Materials Content: 520 lb/cu. yd.
3. Slump Limit: 4 inches plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
6. Use shrinkage reducing admixture meeting ASTM C 494/C 494M as a Type S admixture. No added chloride admixtures only.

2.12 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Not permitted.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete

surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of walls and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 48 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

B. Granular Course: Cover vapor retarder with granular fill, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: 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.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams

or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
6. Finish slabs on grade which receive 1 ½” topping with float with light broom finish for proper bonding of topping slab.

E. 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 average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. 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. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish or to be covered with a coating or covering material applied directly to concrete. Retain rubbed finish in first paragraph below with smooth-formed finish above.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces 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.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill

low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, polished concrete finish or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch (3.2 mm).

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
2. Where slabs on grade are to receive 1 ½” topping, provide broom finish after floating.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.11 CONCRETE PROTECTING 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 ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed 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.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

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 cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

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.

   a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

   1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact

with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete;]one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.

a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
b. Cast and field cure [two] <Insert number> sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

   a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 033000

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. Concrete masonry veneer units (Reflection Stone, Reflection Stone GRAND)
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry-joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.

B. Products Installed by This Section, but Furnished under Another Section:

1. Cast stone masonry units furnished by Section 047200 “Cast Stone Masonry”.
2. Cavity wall insulation furnished by Section 072100 "Thermal Insulation".

C. Products Furnished by This Section, but Installed under Another Section:

1. Anchor sections of adjustable masonry anchors for connecting to structural steel frame furnished to Section 054000 "Cold-Formed Metal Framing".
2. Masonry anchor tie wing and barrel portion of tie furnished to Section 074213 “Insulated Metal Wall Panels” for installation in conjunction with installation of insulated barrier wall panels. Note pintle portion of tie installed by This Section.

D. Related Requirements:

1. Section 076200 “Flashing and Sheet Metal”.
2. Section 079200 "Joint Sealants" for backer rod and sealant installed in masonry expansion and control joints.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 REFERENCES

A. To include the following, among others as appropriate:

1. ASTM A 82 / A 82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM C 140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
3. ASTM C 143 / C 143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
4. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
5. ASTM C 476 - Standard Specification for Grout for Masonry.
6. ASTM C 1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
7. International Building Code (IBC) with Kentucky Building Code amendments, Chapter 21 Masonry.
8. Masonry Standards Joint Committee (MSJC).
9. National Concrete Masonry Association (NCMA): TEK Manual for Concrete Masonry Design and Construction.
10. American Concrete Institute (ACI): ACI 117- Specification for Tolerances for Concrete Construction and Materials.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection: For each product specified, two samples, representing types, colors, textures, and finishes to be installed. Physical samples shall be provided at the same time as the submittal, such samples are to include, at a minimum:

1. Concrete masonry veneer.
2. Mortar sample kit.
3. Weep holes/cavity vents.
4. Mortar collection trapezoidal mesh (MortarNet basis of design).

1.7 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:

1. Masonry units.

    a. Include data on material properties.
    b. For masonry units, include data and calculations establishing average net-area compressive strength of units.

2. Integral water repellant used in CMUs and concrete masonry veneer units.
3. Cementitious materials. Include name of manufacturer, brand name, and type.
4. Mortar admixtures.
5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
6. Grout mixes. Include description of type and proportions of ingredients.
7. Reinforcing bars.
8. Joint reinforcement.
9. Anchors, ties, and metal accessories.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

C. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

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. Do not mark on any surface of the concrete masonry veneer units (with the exception of the rear face) with any permanent substance. Contractor shall be responsible for replacement of concrete masonry veneer unit if any marking is evident on visible surfaces during or after placement.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

E. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

F. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD 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 down both sides of walls, and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.

B. Do not apply uniform floor 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 doors, 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 TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

F. Requirements for Concrete Masonry Veneer Units: Temperature and Weather:

1. Protect concrete masonry veneer units from rain and freezing temperatures prior to, during, and for 48 hours after installation of materials.
2. When ambient temperature is below 40 degrees F or exceeds 90 degrees F, comply with requirements for project conditions in accordance with MSJC Specification for Masonry Structures including the following:

a. Par. 1.8 C. Cold Weather Construction.
b. Par. 1.8 D. Hot Weather Construction.

3. Do not continue masonry construction during heavy rains, as partially set or plastic mortar is susceptible to washout until 8 to 24 hours of curing occurs (depending upon environmental conditions).
4. When rain is likely, cover construction materials. Newly constructed masonry shall be protected from rain by draping a weather-resistant covering over the assembly. The cover shall be secured in place and extend over mortar that is susceptible to washout.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Concrete 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.

B. Basis-of-Design Manufacturer and Product for Concrete Masonry Veneer Units: Provide “County Materials Corporation, “Stillness” Reflection Stone and Reflection Stone GRAND full veneer masonry units”, or, subject to compliance with requirements, a comparable product by written request for substitution during bidding.

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.

2.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.4 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 knock-out bond beams, lintels, corners, jambs, movement control joints, and other special conditions.
2. Provide bullnose units for exposed outside corners unless otherwise indicated. Provide square-edged units where masonry units will be concealed by other construction.

B. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2500 psi.
2. Density Classification: Normal weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

2.5 CONCRETE MASONRY VENEER UNITS

A. Basis-of-Design Manufacturer and Product: Provide “County Materials Corporation, “Stillness” Reflection Stone and Reflection Stone GRAND full veneer masonry units”, or, subject to compliance with requirements, a comparable product by written request for substitution during bidding.

B. Concrete Masonry Veneer Units:

1. Description: Normal weight, integrally pigmented loadbearing solid units with a net area compressive strength of greater than or equal to 5000 psi.
2. Compliance: ASTM C.1634 & ASTM C 90.
3. Recycled Content: Up to 30 percent Supplementary Cementitious Materials.
4. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
5. Units specified to have a fine finish surface face mix.
6. Concrete Masonry Veneer Units are to be manufactured with an integral polymer emulsion water repellent.
7. Size and Shape: 3-3/4 inches depth nominal with face dimensions selected from manufacturers standard face sizes to match random pattern as indicated on Drawings or established in the approved mock-up.
8. Color: Variegated color blending as selected from manufacturers standard selections.

2.6 CONTROL JOINTS IN CONCRETE MASONRY VENEER

A. Control Joints shall be built into Concrete Masonry Veneer Unit walls according to the recommendations of NCMA TEK 10-4. Joints shall not exceed the lesser of: a maximum panel length to height ratio of 1-1/2:1 or a distance of 20 ft.

B. Control Joint Gasket: 2-5/8 inch PVC compound with 80 Durometer hardness conforming to ASTM D 2240.

C. Backer Rods: Backer rod diameter shall be 1/8 inch larger than width of the control joint.

D. Sealant at control joints:

1. Elastomeric polyurethane conforming to ASTM C 920.
2. Acceptable Products: Sonolastic NP 2 as manufactured by Sonneborn or manufacturer approved equal.
3. Sealant depth at midpoint shall be minimum 1/4 inch; maximum 3/8.
4. Sealant color shall match color of Concrete Masonry Veneer Unit.
5. Sand to be mixed into sealant to mimic look of mortar.

2.7 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, 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.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Masonry Cement: ASTM C 91/C 91M.

D. Colored Cement Products for Masonry Veneer: Packaged blend made from masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Colored Masonry Cement:

a. Basis-of-Design Product: Subject to compliance with requirements, provide “Essroc i.design flamingo Brixment X-25 (with Ohio River masonry sand)”, or comparable products by one of the following:

1) Other approved equivalent.

2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
3. Pigments shall not exceed 5 percent of masonry cement by weight.

E. 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 thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

F. Aggregate for Grout: ASTM C 404.

G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

H. Water: Potable.

2.8 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. 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 diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Wire Size for Veneer Ties: 0.148-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

D. Masonry-Joint Reinforcement for Single-Wythe Masonry:

1. Ladder type with single pair of side rods.
2. Truss Type: Fabricated from cold drawn steel wire ASTM A 82; conforming to ASTM A 951; 9 gauge deformed side rods conforming to ASTM A 496 / A 496M; 9 gauge cross rods.

    a. Coating for Corrosion Protection: Mill galvanized per ASTM A 641 / A 641M, Zinc Coated (0.1 oz. per sq.ft.).
    b. Coating for Corrosion Protection: Hot-dipped galvanized per ASTM A 153 / A 153M Class B.
    c. Acceptable Products:

        1) Truss Type Series 300 / 2 Wire System as manufactured by Wire Bond, or equivalent.

2) #120 Truss-Mesh as manufactured by Hohmann and Barnard, Inc., or equivalent.
3) Subject to compliance with these Specifications, other manufacturers and respective products may be submitted for consideration and approval as an equivalent product for substitution.

d. Width: Nominal 4 inches wire; actual - approximately 2 inches.

3. Install continuously in horizontal mortar joints in vertical intervals of not more than 16 inches O.C.

2.9 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.

B. 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 (Building Interior Use Only): 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. Galvanized-Steel Sheet (Building Interior Use Only): ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
4. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
5. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. 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- 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 made from 0.187-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.

D. Partition Top Anchors: 0.105-inch- thick metal plate with a 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

E. Adjustable Masonry-Veneer Anchors at Insulated Barrier Wall Panels:

1. Plate Portion: 14 gauge; Hot-dipped galvanized ASTM A 153 / A 153M Class B.
2. Ties: 3/16 inch diameter wire; Hot-dipped galvanized ASTM A 153 / A 153M Class B.

3. Basis-of-Design Product: Subject to compliance with requirements, provide "Hohmann & Barnard, Inc., Thermal 2-Seal Wing Nut Anchor", or, subject to compliance with these Specifications, other manufacturers and respective products may be submitted for consideration and approval as an equivalent product for substitution.
4. Wing Nut Tie: Polymer coated carbon steel (ASTM 510 and ASTM C954) single screw veneer tie with 5/16-inch hex head and with a dual-diameter barrel with factory-installed EPDM washers to seal at the face of insulation and face of support. with projecting wings to accept standard hook and spin to allow adjustment of pintles to orient parallel to masonry joint, and with 3/16-inch diameter Type 304 stainless steel wire pintle.

    a. Length of barrel required established by thickness of insulated barrier wall panel and proper engagement to cold-formed metal stud structure.
    b. Size of pintle required established by depth of cavity and with pintle extending to at least halfway through veneer wythe but with at least 5/8-inch cover on outside face of veneer wythe.

5. Furnish wing nut barrel tie portion of tie to Section 074213 Insulated Metal Wall Panels for installation by insulated barrier wall panel installer during installation of insulated barrier wall panels. Masonry contractor shall coordinate tie layout and spacing with insulated barrier wall panel installer during insulated barrier wall panel installation.
6. Ties shall be of sufficient length to embed longitudinal portion of tie into center of concrete masonry veneer +/- 1 inch.
7. Anchors installation methods shall be per NCMA TEK 3-6C-12.
8. Basis-of-Design manufacturer recommends 1 tie / 1.77 ft2 of wall surface for Concrete Masonry Veneer Units.

2.10 EMBEDDED FLASHING MATERIALS

A. Through-Wall Flexible Flashing: Use the following unless otherwise indicated:

1. Asphalt-Coated Copper Flashing: 5-oz./sq. ft. copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
2. Basis-of-Design Manufacturer and Product: Subject to compliance with requirements, provide "Hohmann & Barnard, Inc.; H & B C-Fab Flashing", or comparable product by one of the following:

    1) Advanced Building Products Inc.; Copper Fabric Flashing.
    2) AFCO Products Inc.; Copper Fabric.
    3) Phoenix Building Products; Type FCC-Fabric Covered Copper.
    4) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
    5) York Manufacturing, Inc.; York Copper Fabric Flashing.
    6) Other approved equivalent.

3. Application Locations: Unless otherwise indicated, the following:

a. Flashing fully concealed installed in cavity wall extending to outside face of masonry veneer, at the following locations:

1) In cavity wall at the floor elevation.
2) In cavity wall at top of masonry wall.

B. Self-Adhering Membrane: Use the following unless otherwise indicated:

1. Rubberized-Asphalt Membrane: Self-adhering membrane consisting of an SBS rubberized asphalt compound integrally laminated to engineered thermoplastic film. The membrane is specifically designed for use as a self-adhered sheet air and vapor barrier in cavity wall construction where high service temperatures or exposure temperatures are anticipated.

2. Basis-of-Design Manufacturer and Product: Subject to compliance with requirements, provide "Henry Company, Blueskin SA HT", or subject to compliance with these Specifications, other manufacturers and respective products may be submitted for consideration and approval as an equivalent product for substitution.

3. Formulated for use in service temperatures up to 180 degrees F
4. Membrane shall have the following physical properties:

a. ASTM E2357: Standard Test Method for Determining Air Leakage of Air Barrier Assemblies,
b. Air leakage: <0.0001 CFM/ft² @1.6 lbs/ft^2 to ASTM E2178 and ASTM E283 and have no increased air leakage when subjected to a sustained wind load of 10.5 lbs/ft^2 for 1 hour and gust wind load pressure of 62.8 lbs/ft^2 for 10 seconds when tested at 1.6 lbs/ft^2 to ASTM E331,
c. Vapor permeance: 0.03 perms to ASTM E96 (Desiccant Method),
d. Thermal Stability 203F to ASTM D 1204,
e. Compound Stability 212F to ASTM D 5147,
f. Elongation: 200% to ASTM D412-modifed,
g. Class A flame spread index and Class A smoke developed index
h. Air permeance rating of 0.004 cfm/ft(squared) @ 1.57 psf.

5. Primer

a. Primer for self-adhering membranes at temperatures above 25 degrees F shall be 'Aquatac Primer' manufactured by Henry; a polymer emulsion based adhesive, quick setting. Primer shall have the following physical properties:

1) Solids by weight: 53%,
2) Water based, no solvent odors,
3) Drying time (initial set): 30 minutes at 50% RH and 70 degrees F

b. Adhesive with low VOC content for self-adhering membranes at all temperatures shall be 'Blueskin LVC Adhesive' manufactured by Henry, a

synthetic rubber based adhesive, quick setting, having the following physical properties:

1) VOC: <240 g/L,
2) Solids by weight: 40%,
3) Drying time (initial set): 30 minutes

6. Application: Unless otherwise indicated, the following:

a. At top of foundation across unit masonry ledge each way, turned down over face of foundation wall and turned up onto metal framing at metal stud framed walls and turned up onto concrete block at masonry cavity walls, as indicated on Drawings.

C. Flashing for Concrete Masonry Veneer Units:

1. 40-mil flexible flashing with integral drainage mat, stainless steel drip edge and weep tabs.
2. Acceptable Products: TotalFlash as manufactured by Mortar Net USA, Ltd. or manufacturer approved equal.

D. Adhesives, Primers, and Seam Tapes for Flashings and Membranes: Flashing and membrane manufacturer's standard products or products recommended by flashing and membrane manufacturers for bonding flashing and membrane sheets to each other and to substrates.

E. Termination Bars for Flexible Flashing: Aluminum or Stainless steel bars 1/8- inch by 1 inch.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded 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-684 with a durometer hardness of 85 (+or – 5) and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

1. Available Manufacturer and Product:

a. Basis-of-Design Manufacturer and Product: “Hohmann & Barnard, Inc., VS Series – PVC Control Joint, Model VS Standard”. Subject to compliance with these Specifications, other manufacturers and respective products may be submitted for consideration and approval as an equivalent product for substitution.

2. Contractor Option: As an alternate to the use of a sash block for the control joint, a stretcher block may be used provided the control joint gasket is revised as

indicated and the cavity space is filled solid with concrete grout according the gasket manufacturer's requirements.

a. Available Manufacturer and Product:

1) Basis-of-Design Manufacturer and Product: "Hohmann & Barnard, Inc., VS Series – PVC Control Joint, Model VS 678". S subject to compliance with these Specifications, other manufacturers and respective products may be submitted for consideration and approval as an equivalent product for substitution.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

D. Weep/Cavity Vent Products: Use the following unless otherwise indicated:

1. Vinyl Weep Hole/Vent: Units made from flexible PVC, designed to fit into a head joint and consisting of a louvered vertical unit, honeycomb-style polypropylene vent; sized for concrete masonry veneer unit specified, in color, "gray".

a. Basis-of-Design Manufacturer and Product: "Hohmann & Barnard, Inc.,QV – Quadro-Vent". S subject to compliance with these Specifications, other manufacturers and respective products may be submitted for consideration and approval as an equivalent product for substitution.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Configuration: Provide one of the following:

a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.

2.12 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.

B. Cleaners for Concrete Masonry Veneer Units, coordinate with manufacturer requirements:

1. Non muriatic acid cleaner.
2. As applicable and after a test area is prepared.

a. Acceptable Product: SureKlean Custom Masonry Cleaner, as manufactured by PROSOCO.
b. Acceptable Product: NMD-80 as manufactured by EaCo Chem Inc.

2.13 MASONRY SEALERS

A. Follow manufacturer's recommended instructions.

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 the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that impair mortar bond.

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 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. Mix units from several pallets or cubes as they are placed.

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 or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch 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, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, and sills, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch 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, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

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 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 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping 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 unit 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 under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build nonload-bearing interior partitions full height of story to underside of solid floor structure above unless otherwise indicated.

1. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.

3.5 INSTALLATION OF CONCRETE MASONRY VENEER UNITS

A. Laying Concrete Masonry Veneer Units:

1. Install concrete masonry veneer units in accordance with MSJC Specifications for Masonry Structures and manufacturer's instructions.
2. Bond Pattern for Exposed Masonry: Random ashlar.
3. Lay units by selecting product from more than one pallet at a time during installation.
4. Lay units with full mortar head and bed joints.
5. All cutting shall be done with masonry saw to provide, clean, sharp, unchipped edges.
6. Do not use masonry units with broken corners and edges in excess of ASTM C90 and ASTM C1634.
7. Temporary Formwork and Shores: Construct formwork to support reinforced masonry elements during construction.
8. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
9. Do not mark ends of units, or surfaces of units that will be exposed at completion, with any permanent-type methods; markings must be able to be easily removed after unit is installed. If markings are not easily removed, Contractor shall replace unit at their expense.

B. Control Joints: Designed to reduce restraint and permit longitudinal movement. Per NCMA Tek Note 10-2C and 10-4, proper control joint spacing is required for concrete masonry veneer walls:

1. Concrete Masonry Veneer Unit: Joints shall not exceed the lesser of: a maximum panel length to height ratio of 1-1/2:1.

C. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

D. Protection

1. Protect installed work from damage due to subsequent construction activity on the site.
2. Protect masonry materials during storage and construction to prevent moisture intrusion and soilage.
3. During erection, cover tops of walls to prevent moisture penetration into concrete masonry veneer units and cavities of wall system.
4. Provide final protection and maintain jobsite conditions that ensure concrete masonry veneer units are without damage, deterioration, or soiling.

3.6 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

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. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush where indicated to receive wall insulation, cavity wall and air barriers unless otherwise indicated.

3.7 ANCHORED MASONRY VENEERS AT INSULATED BARRIER WALL PANELS

A. Anchor masonry veneers at insulated barrier wall panels with masonry-veneer anchors to comply with the following requirements:

1. Furnish wing nut barrel tie portion of tie to Section 074215 Insulated Barrier Wall Panels for installation by insulated barrier wall panel installer during installation of insulated barrier wall panels.
2. Masonry contractor shall coordinate tie layout and spacing with insulated barrier wall panel installer during insulated barrier wall panel installation. Locate anchor sections to allow maximum vertical differential movement of ties up and down.

    a. Space anchors not more than 16 inches o.c. vertically and 16 inches o.c. horizontally, with not less than one anchor for each 1.77 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 32 inches, around perimeter.

3. Embed pintle tie sections in masonry veneer joints with pintle extending to at least halfway through masonry veneer wythe but with at least 5/8-inch cover on outside face of masonry veneer wythe.

B. Provide not less than 1-3/4 inch of airspace between back of masonry veneer and face of insulated barrier wall panel as indicated on Drawings.

1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.8 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control 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.

3.9 ANCHORING MASONRY TO STRUCTURAL STEEL

A. Anchor masonry to structural steel, where masonry abuts or faces structural steel, to comply with the following:

1. Provide an open space not less than 1/2 inch wide between masonry and structural steel 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 o.c. vertically.

3.10 ANCHORING MASONRY TO CONCRETE

A. Anchor masonry to concrete, where masonry abuts or faces concrete, to comply with the following:

1. Anchor masonry with anchors embedded in masonry joints and attached to concrete.
2. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally.

3.11 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 using the following method:

1. Install preformed control-joint gaskets designed to fit standard sash block.

a. Alternate: The use of stretcher block in lieu of sash block may be used provided the specified preformed control-joint gasket is revised as indicated and the void space is filled solid with concrete grout.

C. Form expansion joints in masonry veneer as follows:

1. Form open joint full depth of masonry veneer wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

3.12 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete masonry lintels where shown and where openings of more than 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.13 BOND BEAMS

A. Provide masonry bond beams at the top 8-inch CMU course of all CMU walls using knock-out bond beam CMU block. Provide bond beams with bar reinforcing as indicated on Drawings.

1. If a knock-out block is not available, saw-cut webs of standard block to simulate a knock-out bond beam block configuration.
2. Interrupt bond beam bar reinforcement at control joints

3.14 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at base of wall and top of wall to facilitate upward flow of air in cavities, 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 masonry-veneer walls with insulated barrier wall panels, extend flashing through veneer, across airspace behind veneer, and behind wall panels at least 4 inches as indicated.
3. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/cavity vent products to form weep holes.
2. Space weep holes 24 inches o.c. unless otherwise indicated.

D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

E. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.

3.15 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 that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

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 TMS 602/ACI 530.1/ASCE 6 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 12.67 ft.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Contractor shall engage testing agency 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: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.

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. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

D. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.17 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 nonmasonry 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 concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.18 MASONRY WASTE DISPOSAL

A. Masonry Waste Recycling: Return broken CMUs and Concrete Masonry Veneer Units not used as fill to manufacturer for recycling.

B. Salvageable Excess Masonry and Waste Masonry:

1. Salvageable excess uncut masonry units are to be stacked in an on-site location acceptable to the Owner and turned over to the Owner.
2. All other excess masonry materials and cut masonry are Contractor's property. At completion of unit masonry work, Contractor to remove excess cut masonry and other excess masonry materials and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 047200 - CAST STONE 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. Cast-stone trim including the following:

a. Wainscot band.
b. Column base.
c. Column cap.

B. Related Sections:

1. Section 042000 "Unit Masonry" for installing cast-stone units in unit masonry.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For cast-stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for cast-stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

1. Include building elevations showing layout of units and locations of joints and anchors.

C. Samples for Initial Selection: For colored mortar.

D. Samples for Verification:

1. For each color and texture of cast stone required, 10 inches square in size.
2. For each trim shape required, 10 inches in length.
3. For colored mortar, make Samples using same sand and mortar ingredients to be used on Project.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

1. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C 1364.

B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

1. Provide test reports based on testing within previous two years.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast-stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute, the Architectural Precast Association, or approved equivalent certified program.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

C. Mockups: Furnish cast stone for installation in mockups specified in Section 042000 "Unit Masonry."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work.

B. Pack, handle, and ship cast-stone units in suitable packs or pallets.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast-stone units if required, using dollies with wood supports.
2. Prevent contact with dirt and splashing.
3. Store cast-stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

a. Do not double stack pallets.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store mortar aggregates where grading and other required characteristics can be maintained, and contamination can be avoided.

1.7 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Cast Stone: Obtain cast-stone units from single source from single manufacturer.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

2.2 CAST-STONE MATERIALS

A. General: Comply with ASTM C 1364.

B. Portland Cement: ASTM C 150/C 150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast-stone color indicated.

C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33/C 33M; gradation and colors as needed to produce required cast-stone textures and colors.

D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33/C 33M, gradation and colors as needed to produce required cast-stone textures and colors.

E. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

F. Admixtures: Use only admixtures specified or approved in writing by Architect.

1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.

2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
3. Air-Entraining Admixture: ASTM C 260/C 260M.
4. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
5. Water-Reducing, Retarding Admixture: ASTM C 494/C 494M, Type D.
6. Water-Reducing, Accelerating Admixture: ASTM C 494/C 494M, Type E.

G. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60 (Grade 420). Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches (38 mm) of cast-stone material.

1. Epoxy Coating: ASTM A 775/A 775M.
2. Galvanized Coating: ASTM A 767/A 767M.

H. Embedded Anchors and Other Inserts: Fabricated from [stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304.

2.3 CAST-STONE UNITS

A. Cast-Stone Units: Comply with ASTM C 1364.

1. Casting Method: vibrant dry tamp or wet-cast method as specified and/or required.
2. Units shall be resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.

B. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.

1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
3. Provide drips on projecting elements unless otherwise indicated.

C. Fabrication Tolerances:

1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.

D. Cure Units as Follows:

1. Cure units in enclosed, moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
2. Keep units damp and continue curing to comply with one of the following:

a. No fewer than five days at mean daily temperature of 70 deg F or above.

E. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

F. Colors and Textures: As selected by Architect from manufacturer's full range.

2.4 MORTAR MATERIALS

A. Provide mortar materials that comply with Section 042000 "Unit Masonry."

B. Portland Cement: ASTM C 150/C 150M, 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.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. 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 thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

F. Water: Potable.

2.5 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.

B. Dowels: 1/2-inch-diameter round bars, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.

C. 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 cast-stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.6 MORTAR MIXES

A. Comply with requirements in Section 042000 "Unit Masonry" for mortar mixes.

B. 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 mortar unless otherwise indicated.

C. Comply with ASTM C 270, Proportion Specification.

1. For setting mortar, use Type N.
2. For pointing mortar, use Type N.

D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.
2. Application: Use colored-aggregate mortar for exposed mortar joints.

2.7 SOURCE QUALITY CONTROL

A. Engage a qualified independent testing agency to sample and test cast-stone units according to ASTM C 1364.

1. Include one test for resistance to freezing and thawing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, 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 SETTING CAST STONE IN MORTAR

A. Install cast-stone units to comply with requirements in Section 042000 "Unit Masonry."

B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.

1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
2. Coordinate installation of cast stone with installation of flashing specified in other Sections.

C. Wet joint surfaces thoroughly before applying mortar or setting in mortar.

D. Set units in full bed of mortar with full head joints unless otherwise indicated.

1. Set units with joints 1/4 to 3/8 inch wide unless otherwise indicated.
2. Build anchors and ties into mortar joints as units are set.
3. Fill dowel holes and anchor slots with mortar.
4. Fill collar joints solid as units are set.
5. Build concealed flashing into mortar joints as units are set.
6. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
7. Keep joints at shelf angles open to receive sealant.

E. Rake out joints for pointing with mortar to depths of not less than 3/4 inch. Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.

F. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.

G. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.

H. Rake out joints for pointing with sealant to depths of not less than 3/4 inch. Scrub faces of units to remove excess mortar as joints are raked.

I. Point joints with sealant to comply with applicable requirements in Section 079200 "Joint Sealants."

1. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.

J. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.

1. Keep joints free of mortar and other rigid materials.
2. Build in compressible foam-plastic joint fillers where indicated.
3. Form joint of width indicated, but not less than 3/8 inch.
4. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.

5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

B. Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

3.4 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses.

1. Remove mortar fins and smears before tooling joints.
2. Remove excess sealant immediately, including spills, smears, and spatter.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 047200

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. Wood blocking.
2. Plywood backing panels.

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 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.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal 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.

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.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood blocking, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply 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 beyond the centerline of the burners at any time during the test.

1. Treatment shall 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.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat the following:

1. Concealed blocking.
2. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.

B. Dimension Lumber Items: Construction or No. 2

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 used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated or required that comply with requirements specified in this article for material and manufacture.

B. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

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 accurately to other construction. Locate blocking and similar supports to comply with requirements for attaching other construction.

B. Install plywood backing panels by fastening to substrate. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

D. 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.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

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.

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. Roof sheathing.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for plywood backing panels.

1.3 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 plywood complies 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 plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.

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 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-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

B. 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.

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: Treat plywood where indicated on Drawings and plywood used with roofing, flashing, vapor barriers, and waterproofing.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

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 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 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 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/D 3201M at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing, span ratings for temperatures up to 170 deg F shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat plywood indicated on Drawings, and the following:

1. Roof sheathing.

2.5 WALL SHEATHING

A. Plywood Sheathing: DOC PS 2, Exposure 1 sheathing.

1. Nominal Thickness: 5/8 inch.

2.6 ROOF SHEATHING

A. Plywood Sheathing: DOC PS 2, Exposure 1 sheathing.

1. Nominal Thickness: 5/8 inch.

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. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

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. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Coordinate 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.

E. 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. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 061600

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood roof trusses.

1.2 ACTION SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

B. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6. Show splice details and bearing details.

C. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.

B. Evaluation Reports: For the following, from ICC-ES:

1. Metal-plate connectors.
2. Metal truss accessories.

1.4 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.

B. Structural Performance: Metal-plate-connected wood trusses shall be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1.

C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.

D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (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. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

2. Use of No. 3 grade lumber is not permitted

B. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

2.3 METAL CONNECTOR PLATES

A. General: Fabricate connector plates to comply with TPI 1.

B. Hot-Dip 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); G60 coating designation; and not less than 0.036 inch thick.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
2. Where trusses are exposed to weather, in ground contact, 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.

2.5 METAL FRAMING ANCHORS AND ACCESSORIES

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. Simpson Strong-Tie Co., Inc.
2. USP Structural Connectors.

B. Allowable design loads, as published by manufacturer, shall comply with or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

2.6 FABRICATION

A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

F. Securely connect each truss ply required for forming built-up girder trusses.

G. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install bracing to comply with Section 061000 "Rough Carpentry."

H. Install wood trusses within installation tolerances in TPI 1.

I. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.

J. Replace wood trusses that are damaged or do not comply with requirements.

END OF SECTION 061753

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. Extruded polystyrene foam-plastic board.
2. Closed-cell spray polyurethane foam insulation.
3. Glass fiber insulation batts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Low-emitting product certification.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Research Reports: For foam-plastic insulation, from ICC-ES.

1.5 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 until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.

B. Foundation Perimeter Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

1. Thickness: 2-inches
2. Thermal Performance R-value minimum: 5.0 (per 1-inch thickness).
3. Water Absorption, ASTM C272: 0.3% by volume.
4. Compressive Strength ASTM D1621: 25 lb/in2.
5. Board Size: 24-inch by 96-inch.
6. Installation Locations:

    a. Below grade foundation perimeter of building.

7. Manufacturers offering products complying with requirements include Owens Corning ‘Foamular® NGX™ 250’ or an approved equivalent.

C. Cavity-Wall Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

1. Thickness: 2-inches
2. Thermal Performance R-value minimum: 5.0 (per 1-inch thickness).
3. Water Absorption, ASTM C272: 0.3% by volume.
4. Compressive Strength ASTM D1621: 25 lb/in2.
5. Board Size: 24-inch by 96-inch.
6. Installation Locations:

    a. Masonry cavity wall wainscot at perimeter of building.
    b. Face of CMU masonry above wainscot at perimeter of building. Terminate @ bottom chord of pre-engineered wood truss – see drawing detail.

7. Manufacturers offering products complying with requirements include Owens Corning ‘Foamular® NGX™ 250’ or an approved equivalent.

2.2 GLASS FIBER BATT INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Guardian Building Products, Inc.

3. Johns Manville.
4. Knauf Insulation.
5. Owens Corning.

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 30 percent.

C. 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.

D. Composition Requirements: Provide glass-fiber blanket insulation as follows:

1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

E. Install according to batt insulation manufacturer's written instructions.

2.3 CLOSED-CELL SPRAY POLYURETHANE FOAM

A. Manufacturers offering product complying with requirements include The Dow Chemical Company ‘FROTH-PAK foam insulation or an approved equivalent.

B. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II,

1. Nominal density: 1.75 lb/cu. ft.
2. Minimum aged R-value at 1-inch thickness: 6.0 deg F x h x sq. ft./Btu at 75 deg F.
3. Air Leakage, ASTM E283: 0 cfm/ft2 @ 1.57 psf.
4. Water Vapor Permeance, ASTM E96: 3.2 perm @ 1-inch thick / @ 2-inch thick.
5. Water Absorption, ASTM D2126: 3.2% by volume max.
6. Compressive Strength, ASTM D1621: 172 lb/in2, parallel.
7. Maximum Service Temperature: 240 deg F.

C. Surface-Burning Characteristics: Comply with ASTM E 84 / UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 350 or less.

D. Install according to spray foam manufacturer's written instructions.

2.4 ACCESSORIES

A. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

B. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

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. Install insulation with manufacturer's R-value label exposed after insulation is installed.

D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF FOUNDATION PERIMETER INSULATION

A. On vertical foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation down to top of foundation stem wall footing.

B. On horizontal surfaces, 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 in from exterior walls.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

A. Board Insulation: Install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face and as recommended by manufacturer.

1. Fit courses of insulation between obstructions, with edges butted tightly in both directions, and with faces flush.
2. Press units firmly against inside substrates.

3.5 INSTALLATION OF FIBER GLASS BATT INSULATION

A. 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. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.6 INSTALLATION OF SPRAY POLYURETHANE FOAM INSULATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

C. Comply with insulation manufacturer's written instructions applicable to products and applications.

D. Spray insulation to envelop entire area to be insulated and fill voids.

E. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

F. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

B. 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 072500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building wrap.
2. Flexible flashing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

B. Shop Drawings:

1. Show details of building wrap at terminations, openings, and penetrations.
2. Show details of flexible flashing applications.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide the following:

a. DuPont (E. I. du Pont de Nemours and Company); Tyvek Commercial Wrap or StuccoWrap as recommended by exterior wall finish manufacturer.

2. Water-Vapor Permeance: Not less than 50 g through 1 sq. m of surface in 24 hours per ASTM E 96/E 96M, Desiccant Method (Procedure A).

B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber 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).

1. Products: Subject to compliance with requirements, provide one of the following:

a. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Butyl Self Adhered Flashing.
b. Protecto Wrap Company; BT-25 XL.
c. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.

B. Cover sheathing with water-resistive barrier as follows:

1. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.
2. Apply barrier to cover vertical flashing with a minimum 4-inch (100-mm) overlap unless otherwise indicated.

C. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.

1. Lap seams and junctures with other materials at least 4 inches (100 mm) except that at flashing flanges of other construction, laps need not exceed flange width.
2. Lap flashing over water-resistive barrier at bottom and sides of openings.
3. Lap water-resistive barrier over flashing at heads of openings.
4. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 072500

SECTION 073113 - ASPHALT SHINGLES

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-fiber-reinforced asphalt shingles.
2. Underlayment materials.
3. Ridge vents.
4. Metal flashing and trim.

1.3 DEFINITIONS

A. Roofing Terminology: See ASTM D1079 for definitions of terms related to roofing Work in this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Asphalt shingles.
2. Underlayment materials.
3. Ridge vents.
4. Asphalt roofing cement.
5. Elastomeric flashing sealant.

B. Shop Drawings: For metal flashing and trim.

C. Samples: For each exposed product and for each color and texture specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports.

C. Sample Warranty: For manufacturer's materials warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For asphalt shingles to include in maintenance manuals.

B. Materials warranties.

C. Roofing Installer's warranty.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized installer who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture in accordance with manufacturer's written instructions.

B. Store underlayment rolls on end, on pallets or other raised surfaces. Do not double-stack rolls.

C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing Work is not in progress.

D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Proceed with installation only when existing and forecasted weather conditions permit product installation and related Work to be performed in accordance with manufacturer's written instructions and warranty requirements.

1. Install self-adhering, polymer-modified bitumen sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.10 WARRANTY

A. Materials Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.

1. Materials Warranty Period: 30 years from date of Substantial Completion, prorated, with first three years nonprorated.

2. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 80 mph for five years from date of Project Substantial Completion.
3. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for five years from date of Project Substantial Completion.
4. Workmanship Warranty Period: Two years from date of Project Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of product from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance in accordance with ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.3 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Impact-Resistant, Laminated-Strip Asphalt Shingles: ASTM D3462/D3462M, laminated, multi-ply overlay construction; glass-fiber reinforced, mineral-granule surfaced, and self-sealing; with impact resistance complying with UL 2218, Class 4.

1. Butt Edge: Straight cut.
2. Strip Size: Manufacturer's standard.
3. Algae Resistance: Granules resist algae discoloration.
4. Color and Blends: As selected by Architect from manufacturer's full range.

B. Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.4 UNDERLAYMENT MATERIALS

A. Felt: Asphalt-saturated organic felts, nonperforated and complying with the following:

1. ASTM D226/D226M: Type I.

B. Self-Adhering, Polymer-Modified Bitumen Sheet: ASTM D1970/D1970M, minimum 60-mil- thick sheet; glass-fiber-mat-reinforced, polymer-modified asphalt; with slip-resistant top surface and release backing; cold applied.

2.5 RIDGE VENTS

A. Rigid Ridge Vent: Manufacturer's standard, rigid-section, high-density, UV-stabilized plastic ridge vent for use under ridge shingles.

2.6 ACCESSORIES

A. Elastomeric Flashing Sealant: ASTM C920, Type S, Grade NS, one-part, non-sag, elastomeric polymer sealant; of class and use classifications required to seal joints and remain watertight; recommended in writing by manufacturer for installation of flashing systems.

B. Roofing Nails: ASTM F1667, aluminum, stainless steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- diameter, sharp-pointed, with a 3/8-inch diameter flat head and of sufficient length to penetrate 1/8 inch through plywood sheathing.

1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

C. Underlayment Nails: Aluminum, stainless steel, or hot-dip galvanized-steel wire nails with low-profile metal or plastic caps, 1-inch- minimum diameter.

2.7 METAL FLASHING AND TRIM

A. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.

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.

1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored and that provisions have been made for flashings and penetrations through asphalt shingles.
3. Verify that vent stacks and other penetrations through roofing are installed and securely fastened.

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 OF UNDERLAYMENT MATERIALS

A. Comply with asphalt shingle and underlayment manufacturers' written installation instructions and with recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" applicable to products and applications indicated unless more stringent requirements apply.

B. Asphalt-Saturated Felt: Install on roof deck parallel with and starting at eaves and fasten with underlayment nails.

1. Single-Layer Installation:

    a. Lap sides a minimum of 2 inches over underlying course.
    b. Lap ends a minimum of 4 inches.
    c. Stagger end laps between succeeding courses at least 72 inches.

2. Install felt underlayment on roof deck not covered by self-adhering, polymer-modified bitumen sheet unless otherwise specified in this Section or indicated on Drawings.

    a. Lap sides of felt over self-adhering sheet not less than 4 inches in direction that sheds water.
    b. Lap ends of felt not less than 6 inches over self-adhering sheet.

3. Install fasteners in a grid pattern of 12 inches between side laps with 6-inch spacing at side and end laps.

C. Self-Adhering, Polymer-Modified Bitumen Sheet: Install, wrinkle free, on roof deck.

1. Comply with low-temperature installation restrictions of underlayment manufacturer.
2. Install lapped in direction that sheds water.

    a. Lap sides not less than 4 inches.
    b. Lap ends not less than 6 inches, staggered 24 inches between succeeding courses.
    c. Roll laps with roller.

3. Eaves: Extend from edges of eaves 24 inches minimum beyond interior face of exterior wall.
4. Valleys: Extend from lowest to highest point 18 inches on each side of centerline.
5. Ridges: Extend 36 inches on each side without obstructing continuous ridge vent slot.
6. Roof-Slope Transitions: Extend 18 inches on each roof slope.

7. Cover underlayment within seven days.

3.3 INSTALLATION OF METAL FLASHING AND TRIM

A. Install metal flashings and trim to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

1. Install metal flashings in accordance with recommendations in ARMA's "Asphalt Roofing Residential Manual - Design and Application Methods" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

B. Open-Valley Flashings: Install centered in valleys, lapping ends at least 8 inches in direction that sheds water. Fasten upper end of each length to roof deck beneath overlap.

1. Secure hemmed flange edges into metal cleats spaced 12 inches apart and fastened to roof deck.
2. Adhere minimum 9-inch wide strips of self-adhering, polymer-modified bitumen sheet to metal flanges and to underlying self-adhering sheet, polymer-modified bitumen sheet.

a. Place strips parallel to and over flanges so that they will be just concealed by installed shingles.

3. Provide a closure at the end of the inverted-V profile of the valley metal to minimize water and ice infiltration.

C. Counterflashings: Coordinate with installation of base flashing and fit tightly to base flashing. Lap joints a minimum of 4 inches secured in a waterproof manner.

D. Rake Drip Edges: Install over underlayment materials and fasten to roof deck.

E. Eave Drip Edges: Install below underlayment materials and fasten to roof deck.

F. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4 INSTALLATION OF ASPHALT SHINGLES

A. Install asphalt shingles in accordance with manufacturer's written instructions and recommendations in ARMA's "Asphalt Roofing Residential Manual - Design and Application Methods" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed with self-sealing strip face up at roof edge.

1. Extend asphalt shingles 1/2 inch over fasciae at eaves and rakes.

C. Install first and remaining courses of laminated asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Fasten asphalt shingle strips with a minimum of four roofing nails, but not less than the number indicated in manufacturer's written instructions for roof slope and design wind speed indicated on Drawings and for warranty requirements specified in this Section.

1. Locate fasteners in accordance with manufacturer's written instructions.
2. Where roof slope is less than 4:12, hand seal self-sealing asphalt shingles to improve the shingles' positive bond by applying asphalt roofing cement spots between course overlaps after nailing the upper course.
3. When ambient temperature during installation is below 50 deg F (10 deg C), hand seal self-sealing asphalt shingles by applying asphalt roofing cement spots between course overlaps after nailing the upper course.

E. Ridge Vents: Install continuous ridge vents over asphalt shingles in accordance with manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

F. Ridge Shingles: Maintain same exposure of cap shingles as roofing-shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds.

1. Fasten with roofing nails of sufficient length to penetrate sheathing.
2. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION 073113

SECTION 074645 - FIBER-CEMENT SIDING

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. Fiber-cement siding and trim.

B. Related Requirements:

1. Section 061053 "Rough Carpentry" for wood nailers, blocking, and plywood backing panels.
2. Section 061600 "Sheathing" for wall sheathing and sheathing joint and penetration treatment.
3. Section 072500 “Weather Barriers” for water-resistive barriers including building wrap substrates.
4. Section 076200 "Sheet Metal Flashing and Trim" for prefinished metal flashing.
5. Section 079200 "Joint Sealants" for joint sealant installation.

1.3 COORDINATION

A. Coordinate siding installation with weather-resistive barriers, flashings, and other adjoining construction to ensure proper sequencing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples for Initial Selection: For fiber-cement siding including related accessories.

C. Samples for Verification: For each type, color, texture, and pattern required.

1. 12-inch long-by-actual-width Sample of siding.
2. 12-inch long-by-actual-width Samples of trim and accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of fiber-cement siding.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.

C. Research/Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES.

D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance data: For each type of product, including related accessories, to include in maintenance manuals.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with labels intact until time of use.

B. Store materials on elevated platforms, under cover, and in a dry location.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIBER-CEMENT SIDING & TRIM

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Basis-of-Design Product: James Hardie Building Products, Inc., “Hardie Panel Vertical Siding” and “HardieTrim” at corners and openings.

a. Other acceptable comparable product.

B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Vertical Panel Siding:

1. Type (VPS1):

a. Nominal Thickness: 5/16-inch
b. Texture: *Select Cedarmill*

D. Batton Boards:

1. Type (BB1):

a. Nominal Thickness: 3/4-inch
b. Texture: *Rustic Grain*
c. Width: 2 ½-inch

E. Trim Boards:

1. Type (TB1):

a. Model: 5/4 NT3
b. Nominal Thickness: 1-inch
c. Texture: *Roughsawn*
d. Width: 3 ½-inches

2. Type (TB2):

a. Model: 5/4 NT3
b. Nominal Thickness: 1-inch
c. Texture: *Roughsawn*
d. Width: 5 ½-inches, unless otherwise noted on Drawings.

H. Color: To be selected from manufacturer's full line.

2.2 ACCESSORIES

A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.

1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.

B. Flashing: Provide aluminum flashing complying with Section 076200 "Sheet Metal Flashing and Trim" where indicated.

C. Fasteners:

1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch, or three screw-threads, into substrate.
3. For fastening fiber cement, use hot-dip galvanized fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement siding and related accessories.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Install fasteners no more than 24 inches o.c.

B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074645

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. Formed roof-drainage sheet metal fabrications.
2. Formed wall sheet metal fabrications.
3. Miscellaneous sheet metal fabrication not specified elsewhere.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers and blocking.
2. Section 074313 “Asphalt Shingles.”
3. Section 334105 “Storm Utility Drainage” for connecting downspouts to stormwater drainage downspout boots.

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 manufactured items

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.

6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

1.5 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.

1.6 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.

1.7 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: 20 years from date of Project Completion.

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 NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. 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.

D. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting design pressures as appropriate for the project location and conditions, as confirmed by the manufacturer.

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. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 (Z275) coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275); prepainted by coil-coating process to comply with ASTM A 755/A 755M.

1. Surface: Smooth, flat.
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: To be selected by Owner.

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).

C. Zinc Sheet: 99.995 percent electrolytic high-grade zinc with alloy additives of copper (0.08 to 0.20 percent), titanium (0.07 to 0.12 percent), and aluminum (0.015 percent); with manufacturer's standard factory-applied, flexible, protective back coating.

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. Contrarian Metal Resources; Alloy 710 Zinc.
b. Jarden Zinc Products; Solid Zinc Strip.
c. Rheinzink America Inc.; RHEINZINK.
d. Umicore Building Products USA, Inc.; VM ZINC series.

2. Finish: Preweathered gray.

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

B. Self-Adhering, High-Temperature Sheet: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
b. Grace Construction Products, a unit of W. R. Grace & Co.-Conn.; Grace Ice and Water Shield HT.
c. Henry Company; Blueskin PE200 HT.
d. Kirsch Building Products, LLC; Sharkskin Ultra SA.
e. Metal-Fab Manufacturing, LLC; MetShield.
f. Owens Corning; WeatherLock Specialty Tile & Metal Underlayment.
g. Polyguard Products, Inc.; Deck Guard HT.
h. Protecto Wrap Company; Protecto Jiffy Seal Ice & Water Guard HT.
i. SDP Advanced Polymer Products Inc; Palisade SA-HT.

2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C) or higher.
3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C) or lower.

C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, 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 or manufactured item 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 or manufactured item.

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.

2. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
3. 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. 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 wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone based polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

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 within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

D. 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.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

G. 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.

H. 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-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, and gutter accessories from same metal as gutters.

1. Gutter Profile: Style K according to SMACNA Figure 1-2.
2. Expansion Joints: Lap type.

B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors

1. Fabricated Hanger Style: Fig 1-35B according to SMACNA's "Architectural Sheet Metal Manual."
2. Fabricate from the following materials:

a. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

2.7 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate discontinuous lintel, sill, and similar flashings to extend 6-inches beyond each side of wall openings; and form with 2-inch-high, end dams. Fabricate from the following materials:

1. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.028-inch-thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend 4-inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:

1. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.028-inch-thick.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Metal wrapped, fascia, wall trim and other miscellaneous metal fabrications. Fabricate from the following materials:

1. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.028-inch-thick.

B. Roof-Penetration Flashing: Fabricate from the following materials:

1. Zinc: 0.032-inch-thick.

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 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 sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. 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.

F. 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 into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, 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.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Rivets: Rivet joints in zinc where necessary for strength.

3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. 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 gutter with gutter brackets spaced not more than 24 inches apart to fascia board behind face of drip edge, unless otherwise indicated, and loosely lock to front gutter bead.
3. Install gutter with expansion joints at locations not exceeding, 50 feet apart. Install expansion-joint caps.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.
2. Connect downspouts to underground drainage system.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal and or premanufactured fabrications 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. 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 over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.

C. 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 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.6 MISCELLANEOUS FLASHING INSTALLATION

A. Install straight true and plumb with tight seams/joints and installed to shed water. Seal joints a

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 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. This Section includes sealants for the following applications:

1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:

    a. Control joints in concrete floors.
    b. Expansion and control joints in concrete masonry.
    c. Joints between different materials listed above.
    d. Perimeter joints between materials listed above and frames of doors, wall-mounted light fixtures and other exterior wall penetrations.
    e. Other joints as indicated or required to maintain weather/water and airtight installation of exterior wall.

2. Interior joints using standard sealant in the following vertical surfaces and horizontal nontraffic surfaces:

    a. Control joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints of exterior wall openings include door frames and windows.
    c. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
    d. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    e. Joint between countertops and window stools and adjacent vertical surfaces.
    f. Other joints as indicated, or required to maintain weather-, air-, water- and sanitary-tight installation.

B. Related Requirements:

1. Division 04 Section “Unit Masonry” for masonry control and expansion joint fillers and gaskets.
2. Division 09 Section "Gypsum Board" for sealing perimeter joints.
3. Division 32 Section "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

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. Samples for Verification: For each kind and color of joint sealant required, provide Samples consisting of strips of cured sealants.

D. 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 Certificates: For each kind of joint sealant and accessory, from manufacturer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

C. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.6 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.7 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.
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.

1.8 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace 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.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Ten years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

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. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:

1. Architectural sealants shall have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

B. Additional Movement Capability: Where additional movement capability is specified in the Elastomeric Joint-Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

C. Stain-Test-Response Characteristics: Where elastomeric sealants are specified in the Elastomeric Joint-Sealant Schedule to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

E. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

2.3 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.

2.4 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

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) as approved in writing by joint-sealant manufacturer for joint application

indicated, 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.
c. Other similar materials.

3. Remove laitance and form-release agents from concrete.
4. 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. Metal.
b. Glass.
c. Other similar materials.

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 locations indicated according to Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations 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. Multicomponent Nonsag Urethane Sealant: Provide products complying with the following:

1. Products: Available products include the following:

a. Vulkem 922; Mameco International.
b. Dynatrol II; Pecora Corporation.
c. Flexiprene 2000; Polymeric Systems, Inc.
d. Sikaflex - 2c NS; Sika Corporation.
e. DYmeric 511; Tremco.

2. Type and Grade: M (multicomponent) and NS (nonsag).

3. Class: 25.
4. Additional Movement Capability: 50 percent movement in extension and 50 percent in compression for a total of 100 percent movement.
5. Use Related to Exposure: NT (nontraffic).Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
6. Applications: Exterior control and expansion joints in unit masonry; joints between different materials listed above; perimeter joints between materials listed above and frames of doors and other exterior wall penetrations; other joints as indicated or required to maintain weather/water tight installation of exterior wall.

B. Single-Component Nonsag Urethane Sealant: Provide products complying with the following:

1. Products: Available products include the following:

    a. Chem-Calk 900; Bostik Inc.
    b. Chem-Calk 915; Bostik Inc.
    c. Chem-Calk 945; Bostik Inc.
    d. Vulkem 921; Mameco International.
    e. PR-255; Ohio Sealants, Inc.
    f. Dynatrol I; Pecora Corporation.
    g. Flexiprene 1000; Polymeric Systems, Inc.
    h. PSI-901; Polymeric Systems, Inc.
    i. SM7100 Permathane; Schnee-Morehead, Inc.
    j. DyMonic; Tremco.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
6. Applications: Interior perimeter joints of exterior door frames in exterior wall.

C. Mildew-Resistant Silicone Sealant: Provide products formulated with fungicide that are intended for sealing interior nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes, and that comply with the following:

1. Products: Available products include the following:

    a. 786 Mildew Resistant; Dow Corning.
    b. Sanitary 1700; GE Silicones.
    c. NuFlex 302; NUCO Industries, Inc.
    d. 898 Silicone Sanitary Sealant; Pecora Corporation.
    e. PSI-611; Polymeric Systems, Inc.
    f. Tremsil 600 White; Tremco.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.

4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
6. Applications: Interior joints between porcelain plumbing fixtures.

D. Multicomponent Pourable Urethane Sealant: Provide products complying with the following:

1. Products: Available products include the following:

   a. Chem-Calk 550; Bostik Inc.
   b. Vulkem 245; Mameco International.
   c. Vulkem 255; Mameco International.
   d. Pourthane; W.R. Meadows, Inc.
   e. Elasto-Thane 920 Pourable; Pacific Polymers, Inc.
   f. NR-200 Urexpan; Pecora Corporation.
   g. NR-300 Urexpan, Type M; Pecora Corporation.
   h. PSI-270SL; Polymeric Systems, Inc.
   i. PSI-551/RC-2; Polymeric Systems, Inc.
   j. Sikaflex - 2c SL; Sika Corporation.
   k. SL 2; Sonneborn Building Products Div., ChemRex Inc.
   l. THC-900; Tremco.
   m. THC-901; Tremco.

2. Type and Grade: M (multicomponent) and P (pourable).
3. Class: 25.
4. Uses Related to Exposure: T (traffic)
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
6. Applications: Interior joints in concrete floor slabs exposed to view.

E. Latex Sealant: Provide products complying with the following:

1. Products: Available products include the following:

   a. Chem-Calk 600; Bostik Inc.
   b. NuFlex 330; NUCO Industries, Inc.
   c. LC 160 All Purpose Acrylic Caulk; Ohio Sealants, Inc.
   d. AC-20; Pecora Corporation.
   e. PSI-701; Polymeric Systems, Inc.
   f. Sonolac; Sonneborn Building Products Div., ChemRex, Inc.
   g. Tremflex 834; Tremco.

2. Applications: Interior joints between standard hollow metal frames, doors and and adjacent gypsum board and where indicated between dissimilar materials at interior.

END OF SECTION 079200

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.
2. Section 099113 “Exterior Painting” for field finish painting of factory primed hollow-metal doors and frames.
3. Section 099123 “Interior Painting” for field finish painting of hollow-metal doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

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, 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.

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. Prepare a separate Schedule for each building.

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- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

B. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

2.2 HOLLOW-METAL FRAMES

A. Construct frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Frames: SDI A250.8, Level 3 (16 gauge).

1. Physical Performance: Level A according to SDI A250.4.

2. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.

    a. Construction: Full profile welded.

3. Exposed Finish: Prime.
4. Provide 6-inch high 45 degree angle sanitary stop @ base of toilet partition frames.

2.3 THERMAL-RATED HOLLOW-METAL FRAMES

A. Construct thermal-rated frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Frames: SDI A250.8, Level 3 (16 gauge).

1. Physical Performance: Level A according to SDI A250.4.
2. Type: Thermal break with separation at stop by a durable polymer extrusion that serves as thermal break.

    a. Basis-Of-Design Product: FT Series by Steelcraft.

        1) Other approved equivalent.

3. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.

    a. Construction: Full profile welded.
4. Energy Performance: Tested to ASTM C1363 with thermal transmittance U-factor of 0.45 Btu/sq. ft. x h x deg F.
5. Exposed Finish: Prime.

2.4 HOLLOW-METAL DOORS

A. Construct doors to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors: SDI A250.8, Level 3 (16 gauge).

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.
    c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
    d. Edge Construction: Model 2, Seamless.

e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.

2.5 THERMAL-RATED HOLLOW-METAL DOORS

A. Construct thermal-rated (insulated) doors 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 (16 gauge).

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.
c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
d. Edge Construction: Model 2, Seamless.
e. Core: Polyurethane or Polyisocyanurate.

1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
2) Energy Performance: Certify and label energy performance according to NFRC as follows:

a) Thermal Transmittance (U-factor): Exterior insulated hollow metal door shall have U-factor of not more than 0.50 Btu/sq. ft. x h x deg F when tested according to ASTM C 518.

3. Exposed Finish: Prime.

2.6 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-thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:

1. Monolithic Concrete Slabs:

a. Clip-type anchors, with two holes to receive fasteners.

2.7 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z 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.

F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

G. 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.

H. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

I. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.8 ACCESSORIES

A. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.9 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. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66 mm), steel vertical stiffeners of same material as face sheets extending full-door

height, with vertical webs spaced not more than 6 inches (152 mm) apart. Spot weld to face sheets no more than 5 inches (127 mm) o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.

2. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
3. Top Edge Closures: Close top edges of doors with flush closures, and 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.

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. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
3. 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.
4. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.

5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

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.

2.10 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.

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 for doors and other openings, 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. 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.
b. Install frames with removable stops located on secure side of opening.
c. Install door silencers in frames before grouting.
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. 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, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, 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 plus or minus 1/32 inch.
b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

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 083115 - ACCESS 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 access doors and frames for ceilings.

B. Related Requirements:

1. Division 09 Section “Gypsum Board” where access doors are located in gypsum ceilings.
2. Division 09 Section “Interior Painting” for field painting of factory primed access doors and frames.

1.3 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:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.4 COORDINATION

Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Action Submittals" Article

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

1. Babcock-Davis.
2. Karp Associates, Inc.
3. Milcor Inc.
4. Nystrom, Inc.
5. Other approved equivalent.

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Flush Access Doors with Exposed Flanges:

1. Basis-of-Design Product: Nystrom, Inc., IT-Series.
2. Description: Face of door flush with frame, with exposed flange and continuous piano hinge.
3. Locations: Wood stud framing and wood trusses
4. Door Size: 22 inches by 36 inches

    a. Provide 1-hr fire rated door at attic.

5. Uncoated Steel Sheet for Door: 20-gauge steel, factory primed.
6. Frame Material: 16-gauge steel, factory primed.
7. Insulation: 2-inch Fire-Rated Mineral Fiber; R-8
8. Latch and Lock: Cam latch, screwdriver operated.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Frame Anchors: Same material as door face.

D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

D. Latch Hardware Quantity: Furnish number of latches required to hold doors tightly closed.

2.4 FINISHES

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 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.

D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates 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 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083115

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:

a. "Metal Doors and Frames"

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives

2. NFPA 101 – Life Safety Code
3. NFPA 105 – Smoke and Draft Control Door Assemblies
4. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:

a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.

a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

3. Door Hardware Schedule:

a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.

b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
c. Indicate complete designations of each item required for each opening, include:

1) Door Index: door number, heading number, and Architect's hardware set number.
2) Quantity, type, style, function, size, and finish of each hardware item.
3) Name and manufacturer of each item.
4) Fastenings and other pertinent information.
5) Location of each hardware set cross-referenced to indications on Drawings.
6) Explanation of all abbreviations, symbols, and codes contained in schedule.
7) Mounting locations for hardware.
8) Door and frame sizes and materials.
9) Degree of door swing and handing.

4. Key Schedule:

a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:

a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:

    a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    b. Catalog pages for each product.
    c. Final approved hardware schedule edited to reflect conditions as installed.
    d. Final keying schedule
    e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:

    a. Fire door assemblies, in compliance with NFPA 80.
    b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

    a. For door hardware: DHI certified AHC or DHC.
    b. Can provide installation and technical data to Architect and other related subcontractors.
    c. Can inspect and verify components are in working order upon completion of installation.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:

a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:

a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Accessibility Requirements:

a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference

a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2) Preliminary key system schematic diagram.
3) Requirements for key control system.
4) Address for delivery of keys.

2. Pre-installation Conference

a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Inspect and discuss preparatory work performed by other trades.
c. Review required testing, inspecting, and certifying procedures.
d. Review questions or concerns related to proper installation and adjustment of door hardware.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.

a. Mechanical Warranty

1) Locks

a) Schlage L Series: 3 years

2) Closers

a) LCN 4000 Series: 30 years

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approval of alternate manufacturers and/or products other than those listed as ''Scheduled Manufacturer'' or ''Acceptable Manufacturers'' in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.

B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Metal Doors and Frames”, “Flush Wood Doors”, “Stile and Rail Wood Doors” to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.03 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.04 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Schlage L9000 series

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.

6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
7. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

    a. VandIgard: Provide levers with vandal resistant technology for use at heavy traffic or abusive applications.
    b. Lever Design: 17A.

2.05 CYLINDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

    a. Schlage Everest 29 Primus XP

B. Requirements:

1. Provide cylinders/cores, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer’s series as indicated. Refer to “KEYING” article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.

    a. High Security: dual-locking cylinder with permanent core requiring restricted, patented keyway. Dual-locking mechanism with interlocking finger pin(s) to check for patented features on keys.

3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
4. Nickel silver bottom pins.

2.06 KEYING

A. Scheduled System:

1. Existing factory registered system:

    a. Provide cylinders/cores keyed into Owner’s existing keying system managed by Owner’s locksmith, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference. Contact:

        1) Firm Name: Allegion
        2) Contact Person: John Theil
        3) Telephone: 502-528-4675

B. Requirements:

1. Construction Keying:

a. Replaceable Construction Cores.

1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.

a) 3 construction control keys
b) 12 construction change (day) keys.

2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2. Permanent Keying:

a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.

1) Master Keying system as directed by the Owner.

b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.

c. Provide keys with the following features:

1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
3) Geographically Exclusive: Where High Security or Security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions.

d. Identification:

1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
2) Identification stamping provisions must be approved by the Architect and Owner.
3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

e. Quantity: Furnish in the following quantities.

1) Permanent Control Keys: 3.
2) Master Keys: 6.
3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
4) Key Blanks: Quantity as determined in the keying meeting.

2.07 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. LCN 4010/4110/4020 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Certify surface mounted mechanical closers to meet fifteen million (15,000,000) full load cycles. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within 6-inch (152 mm) top rail without use of mounting plate so that closer is not visible through vision panel from pull side.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.08 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.09 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.10 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where wall stop cannot be used, provide overhead stop.
3. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.11 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:

a. Zero International

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.12 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

K. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

L. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

M. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

N. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

O. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

Abbreviation	Name
IVE	H.B. Ives
LCN	LCN Commercial Division
SCH	Schlage Lock Company
ZER	Zero International Inc

Hardware Set No. 01
For use on mark/door #(s):
101 103
Each to have:

1	EA	CONT. HINGE	224HD	628	IVE
1	EA	CLASSRM DB	L463J C/L @ 48" AFF	626	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 T	626	SCH
1	EA	PUSH PLATE	8200 8" X 16" CFC SPCL	630	IVE
1	EA	PULL PLATE	8305 10" 4" X 16" CTC F SPCL	630	IVE
1	EA	SURFACE CLOSER	4011 MC SRI	689	LCN
1	EA	KICK PLATE	8400 12" X 1 1/2" LDW B-NH-A	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	RAIN DRIP	141AA X D.W.	AA	ZER
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR BOTTOM	365AA	AA	ZER
1	EA	THRESHOLD	655A-223	A	ZER

DRILL PUSH/PULLS PLATES FOR DEADBOLT. SPECIAL LOCATIONS MOUNT PUSH PLATE AT 45" AFF CENTER LINE, PULL AT 43" AFF CENTER LINE.

Hardware Set No. 02
For use on mark/door #(s):
101A 103A 103B
Each to have:

1	EA	CONT. HINGE	224HD	628	IVE
1	EA	PRIVACY W/IND	L9456J 17A 09-544 L283-722	630	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 T	626	SCH
1	EA	WALL STOP	WS401/402CVX	626	IVE
2	EA	SILENCER	SR64	GRY	IVE

LOCATE TOILET PAPER DISPENSER TO ALLOW DOOR TO MEET WALL STOP

Hardware Set No. 03
For use on mark/door #(s):
102
Each to have:

1	EA	CONT. HINGE	224HD	628	IVE
1	EA	STOREROOM W/DEADBOLT	LV9480J 17A 09-544	630	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 T	626	SCH
1	EA	SURFACE CLOSER	4111 SHCUSH MC ST-1586	689	LCN
1	EA	KICK PLATE	8400 12" X 1 1/2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA	AA	ZER
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A-223	A	ZER

INSTALL PERIMETER WEATHER SEALS BEFORE DOOR CLOSER AND MOUNTING BRACKET.

Hardware Set No. 04
For use on mark/door #(s):
102A
Each to have:

HARDWARE BY MANUFACTURER

Hardware Set No. MISC
For use on mark/door #(s):
MISC
Each to have:

6	EA	FSIC CONST CORE	23-030 ICX (ORG)	ORG	SCH
3	EA	CONST CONTROL KEY	48-056-ICX (ORG)	468	SCH
12	EA	CONST CUT KEY	48-101-ICX (ORG)	468	SCH

END OF SECTION

SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum louvers.

1.2 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

D. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

1.4 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

B. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Air Balance Inc.; a Mestek company.
b. Air Flow Company, Inc.
c. Airolite Company, LLC (The).
d. All-Lite Architectural Products.
e. American Warming and Ventilating; a Mestek company.
f. Architectural Louvers; Harray, LLC.
g. Arrow United Industries; a division of Mestek, Inc.
h. Carnes Company, Inc.
i. Cesco Products; a division of Mestek, Inc.
j. Construction Specialties, Inc.
k. Dowco Products Group; Safe Air of Illinois.
l. Greenheck Fan Corporation.
m. Louvers & Dampers; a division of Mestek, Inc.
n. Metal Form Manufacturing, Inc.
o. NCA Manufacturing, Inc.
p. Nystrom, Inc.
q. Pottorff.
r. Reliable Products, Inc.
s. Ruskin Company; Tomkins PLC.
t. United Enertech.

u. Vent Products Co., Inc.

2. Louver Depth: 4 inches.
3. Blade Profile: Plain blade without center baffle.
4. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
5. Louver Performance Ratings:

   a. Free Area: Not less than 7.5 sq. ft. for 48-inch-wide by 48-inch-high louver.
   b. Point of Beginning Water Penetration: 1000 fpm.

6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening.

B. Secure screen frames to louver frames with stainless-steel machine screws with heads finished to match louver, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same type and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Aluminum, 1/2-inch-square mesh, 0.063-inch wire.

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel unless otherwise indicated.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide extended sills for recessed louvers.

F. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.7 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, 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. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

1. Coordinate installation of louvers with fans or other mechanical equipment

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119

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. Hat-channel systems for interior ceilings.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry” for concealed wood blocking.
2. Section 072100 "Thermal Insulation" for thermal insulation installed in non-structural steel framing.
3. Section 092900 "Gypsum Board” for gypsum board panels installed on interior steel framing systems specified in this Section.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: As indicated on Drawings.
2. Depth: As indicated on Drawings.

C. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: 3/4 inch.
2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.

2.2 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, 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 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 framing and accessories plumb, square, and true to line, with connections securely fastened.

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.

3.3 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 o.c. unless otherwise indicated.

B. Direct Furring:

1. Screw hat channels to pre-engineer wood truss framing.

C. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

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. Abuse-resistant gypsum board.
2. Accessories, joint finishing and auxiliary materials.

B. Related Requirements:

1. Section 092216 - Non-Structural Metal Framing for hat channel framed substrate for gypsum board.
2. Section 099123 "Interior Painting", for paint primer and its application to gypsum board surfaces.

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 instructions, 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, 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.

PART 2 - PRODUCTS

2.1 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.

B. 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 Corp.
2. Georgia-Pacific Gypsum LLC.
3. Lafarge North America Inc.
4. National Gypsum Company.
5. Temple-Inland Building Products by Georgia-Pacific.
6. USG Corporation.
7. Other approved equivalent.

2.2 INTERIOR GYPSUM BOARD

A. Abuse-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M.

1. Core: 5/8 inch, Type X
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
4. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 2 requirements.
5. Indentation: ASTM C1629/C1629M, meets or exceeds Level 2 requirements.
6. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 2 requirements.

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:

a. L-Bead: L-shaped; exposed long flange receives joint compound.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

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, 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 setting-type taping compound.
    a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping 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.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

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 thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

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 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. Do not make joints other than control joints at corners of framed openings.

E. 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.in area.
2. Fit gypsum panels around ducts, pipes, and conduits.

F. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- 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.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 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. L-Bead: Use at exposed edges of gypsum board that abut wall surfaces.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, 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, 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 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    a. Paint primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.6 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.

END OF SECTION 092900

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Galvanized metal surfaces.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for zinc-rich shop primer used on steel bollards.
2. Section 081113 "Hollow Metal Doors and Frames" for shop primer used on galvanized hollow metal doors and frames.

1.2 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. Selected by Architect from manufacturer’s full range of available color and gloss options.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, minimum 8 inches square.

a. Samples shall be aged a minimum of seven (7) days prior to submission.
b. Submit two (2) samples per color.

1) On one Sample, apply coats in steps to show each coat required for system.
2) Label each coat of each Sample.

2. Label each Sample for location and application area.

1.3 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.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.4 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.5 CLOSEOUT SUBMITTALS

A. Coating Maintenance Manual: Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touchup procedures, and actual color samples of each color and finish used.

1. Basis-of-Design format for Manual include “Sherwin-Williams, Custodian Project Color and Product Information Report” or acceptable equivalent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer and Products: Subject to compliance with requirements, provide product listed in the Exterior Painting Schedule for the paint category indicated.

1. Subject to compliance with requirements, other manufacturers and available products that may be considered for incorporation into the Work include, but are not limited to the following:

a. Other acceptable equivalent.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range unless otherwise indicated.

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 Architectural Painting Specification 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, but not less than the following:

1. SSPC-SP 2.

E. Shop-Primed Steel S0ubstrates: Clean field welds, bolted connections, and areas where shop paint is abraded. 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 both sides and edges (tops and bottoms) of exterior doors and entire exposed exterior and interior surface of exterior door frames.
3. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
4. 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.

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 exterior paint coating schedule listed thicknesses, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with exterior paint coating schedule listed thicknesses.

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. Galvanized-Metal Substrates (exterior doors, door frames and other exterior galvanized metal surfaces).

1. MPT-1 (Gloss):

a. Primer: S-W Macropoxy 646 Fast Cure Epoxy, B58W610 Series (5–10 mils DFT).
b. 1st coat: Hi-Solids Polyurethane B65-300 Series.
c. 2nd coat: Hi-Solids Polyurethane B65-300 Series.

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:

1. Concrete.
2. Concrete masonry units (CMUs).
3. Steel and iron.
4. Galvanized metal.
5. Gypsum board.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming structural steel.
2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
3. Section 081113 "Hollow Metal Doors and Frames" for shop primer used on hollow metal doors and frames.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 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.

1.5 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer and Products: Subject to compliance with requirements, provide product listed in the Interior Painting Schedule for the paint category indicated.

1. Subject to compliance with requirements, other manufacturers and available products that may be considered for incorporation into the Work include, but are not limited to the following:

a. Other acceptable equivalent.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction. and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.

6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.

C. Colors: As selected by Architect from manufacturer's full range.

2.3 SOURCE QUALITY CONTROL

A. Source Limitations for Paint: Obtain each type and color and finish from same manufacturer.

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. Fiber-Cement Board: 12 percent.
3. Masonry (CMUs): 12 percent.
4. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. 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 Architectural Painting Specification 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 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 exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer. but not less than the following:

1. SSPC-SP 2.
2. SSPC-SP 3.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. 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 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.

E. Painting Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment areas:

    a. Uninsulated metal piping.
    b. Uninsulated plastic piping.
    c. Pipe hangers and supports.
    d. Metal conduit.
    e. Plastic conduit.
    f. Tanks that do not have factory-applied final finishes.
    g. Duct, equipment, and pipe insulation having paintable jacket material.

2. Paint the following work where exposed in occupied spaces:

    a. Uninsulated metal piping.
    b. Uninsulated plastic piping.
    c. Pipe hangers and supports.
    d. Metal conduit.
    e. Plastic conduit.
    f. Duct, equipment, and pipe insulation having paintable jacket material.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

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 INTERIOR PAINTING SCHEDULE

A. Concrete Floors:

1. FPT-1: Water-Based Concrete Floor Sealer System:

    a. First Coat: Sealer, water based, for concrete floors, matching topcoat.
    b. Topcoat: Sealer, water based, for concrete floors.
    c. S-W H&C Concrete Sealer Wet Look Water Based.

        1) Texture: Slip-resistant granules. Submit samples of varying degrees of slip-resistance for Owner to review and select.

B. CMU Substrates:

1. WPT-1: High Performance (Eg-Shel):
2. WPT-2: High Performance (Gloss):

    a. Primer: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300.
    b. 1st coat: S-W Pro Industrial Water Based Catalyzed Epoxy.

        1) Eg-Shel, B73-360 Series.
        2) Gloss, B73-300 Series.

    c. 2nd coat: S-W Pro Industrial Water Based Catalyzed Epoxy.

        1) Eg-Shel, B73-360 Series.
        2) Gloss, B73-300 Series.

C. Steel Substrates (doors, door frames, and miscellaneous steel substrates not defined elsewhere):

1. MPT-2 (Semi-Gloss):

a. Primer: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
b. 1st coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46 Series.
c. 2nd coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46 Series.

D. Galvanized-Metal Substrates (exterior doors, stall doors, door frames):

1. MPT-1 (Gloss):

a. Primer: S-W Macropoxy 646 Fast Cure Epoxy, B58W610 Series (5–10 mils DFT).
b. 1st coat: S-W Hi-Solids Polyurethane B65-300 Series.
c. 2nd coat: S-W Hi-Solids Polyurethane B65-300 Series.

E. Gypsum Board Substrates:

1. CPT-1 (Eg-Shel):

a. Primer: S-W ProMar 200 Zero VOC Latex Primer, B28W2600.
b. 1st coat: S-W ProMar 200 Zero VOC Interior Latex Eg-Shel B26-2600 Series.
c. 2nd coat: S-W ProMar 200 Zero VOC Interior Latex Eg-Shel B26-2600 Series.

END OF SECTION 099123

SECTION 101425 - ROOM-IDENTIFICATION SIGNAGE

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. Section includes room-identification signs that are directly attached to the interior and exterior walls of the building.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.

B. Shop Drawings: For room-identification signs.

1. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
2. 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.

D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.

B. Design Criteria: The drawings and specifications indicate sizes, profiles, and dimensional requirements of signs. Other signs with deviations from indicated dimensions and profiles may be considered, provided deviations do not change the design concept. The burden of proof of equality is on the proposer.

1. Sign Schedules are based upon products as manufactured by ASI Sign Systems.

C. It shall be the responsibility of the Fabricator and Installer to comply with all signage requirements of the Americans with Disabilities Act (ADA). Sign manufacturer shall notify the Architect in writing if ADA requirements differ from these specifications.

1.7 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. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 ROOM-IDENTIFICATION SIGNS

A. Room-Identification Sign (Sign Type P2): Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Provide tactile copy and grade 2 Braille raised 1/32 inch minimum from plaque first surface by manufacturer’s photopolymer bonded process.
2. Text and Typeface: Accessible raised characters and Braille. Typeface as selected from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color. Adhesive-fixed characters are not acceptable.

a. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant ADA regulations and requirements indicated for size, style, spacing, content, position, and colors.
b. Tactile characters to be raised min. 1/32” from surface.

c. Computerized translation of sign copy to be responsibility of the manufacturer.

3. Composite-Sheet Thickness: Manufacturer's standard for size of sign but no less than 0.25 inch.
4. Sign-Panel Perimeter: Finish edges smooth.

   a. Edge Condition: Square cut.
   b. Corner Condition in Elevation: Square.

5. Color(s): As selected by from manufacturer's full range. Provide color chart at time of shop drawing submittal.
6. Accent Band: 1/8-inch (H) x width of sign, brushed aluminum, square edges
7. Logo: ‘Elizabethtown Kentucky’, ‘Strong and Growing Since 1779’
8. Installation Method: System SA, silicone adhesive.

B. Restroom Identification (Sign Type P1): Provide the following signs on the Alcove side of the wall, adjacent to the latch side of restroom doors:

1. Provide the international symbol for Men’s facilities (S1), the international symbol for handicapped accessibility (S6), a message reading “MENS RESTROOM”, also including Group 2 Braille characters.
2. Provide the international symbol for Women’s facilities (S2), the international symbol for handicapped accessibility (S6), a message reading “WOMENS RESTROOM”, also including Group 2 Braille characters.
3. Text and Typeface: Accessible raised characters and Braille. Typeface as selected from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color. Adhesive-fixed characters are not acceptable.

   a. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant ADA regulations and requirements indicated for size, style, spacing, content, position, and colors.
   b. Tactile characters to be raised min. 1/32” from surface.
   c. Computerized translation of sign copy to be responsibility of the manufacturer.

4. Composite-Sheet Thickness: Manufacturer's standard for size of sign but no less than 0.25 inch.
5. Sign-Panel Perimeter: Finish edges smooth.

   a. Edge Condition: Square cut.
   b. Corner Condition in Elevation: Square.

6. Color(s): As selected by from manufacturer's full range. Provide color chart at time of shop drawing submittal.
7. Accent Band: 1/8-inch (H) x width of sign, brushed aluminum, square edges
8. Installation Method: System SA, silicone adhesive.

C. Coordinate final design and layout with Architect.

2.3 SIGN MATERIALS

A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

B. 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 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Adhesive: As recommended by sign manufacturer.

2.5 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.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.

2.6 GENERAL FINISH REQUIREMENTS

A. 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 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. Accessibility: Install signs in locations on walls as indicated on Drawing Sheet A-302 and according to the accessibility standard.

C. 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.

3.2 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. At completion of the installation, clean exposed surfaces of signs in accordance with the manufacturer's written instructions. Touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by the Owner.

END OF SECTION 101425

SECTION 102800 – TOILET 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. Washroom accessories.
2. Custodial accessories.

1.3 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.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.

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 accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in ICC A117.1 for mounting locations for toilet accessories.

2.2 WASHROOM ACCESSORIES

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Basis-of-Design Products:

1. Toilet Accessories: Subject to compliance with requirements, provide products by *Bobrick Washroom Equipment, Inc*., model as indicated for each accessory, or comparable product by one of the following:

a. A & J Washroom Accessories, Inc.
b. American Specialties, Inc.
c. Bradley Corporation
d. Other approved equivalent.

C. TA1 – Grab Bar:

1. Basis-of-Design Product: Bobrick; B-5806X36
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.

a. Finish: Smooth, No. 4, satin finish.

4. Outside Diameter: 1-1/4 inches.
5. Configuration and Length: Straight, 36 inches long.
6. Provide manufacturers mounting kit for each flange installation for wall type indicated where each grab bar is shown.

D. TA2 – Grab Bar:

1. Basis-of-Design Product: Bobrick; B-5806X42
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.

    a. Finish: Smooth, No. 4, satin finish.

4. Outside Diameter: 1-1/4 inches.
5. Configuration and Length: Straight, 42 inches long.
6. Provide manufacturers mounting kit for each flange installation for wall type indicated where each grab bar is shown.

E. TA3 – Grab Bar:

1. Basis-of-Design Product: Bobrick; B-5806X18
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.

    a. Finish: Smooth, No. 4, satin finish.

4. Outside Diameter: 1-1/4 inches.
5. Configuration and Length: Straight, 18 inches long.
6. Provide manufacturers mounting kit for each flange installation for wall type indicated where each grab bar is shown.

F. TA4 – Toilet Tissue (Roll) Dispenser:

1. Basis-of-Design Product: Georgia Pacific; 59009
2. Description: 1-roll jumbo jr. high-capacity toilet paper dispenser
3. Mounting: Surface mounted.
4. Operation: Noncontrolled delivery
5. Capacity: High-capacity 9" jumbo bath tissue dispenser
6. Material and Finish:

    a. High impact plastic construction.
    b. Color: Grey

G. TA5 – Soap Dispenser - Liquid:

1. Basis-of-Design Product: Bobrick; B-2111
2. Description: Designed for dispensing soap in liquid or lotion form, from valve operating at less than 5 lbs of force.
3. Mounting: vertically oriented, surface mounted with concealed wall plate.
4. Capacity: 40 fl oz.
5. Materials: Black molded plastic push button and spout. Soap head-holding mushroom valve. Stainless steel spring. Body of one-piece drawn, seamless, 22 gauge 18-8 S, type-304 stainless steel with satin finish. Lock: Locked, hinged stainless steel lid for top filling.
6. Refill Indicator: Unbreakable clear acrylic refill indicator window

H. TA6 – Mirror Unit:

1. Basis-of-Design Product: Bobrick; B-1556 1830
2. Frameless stainless steel mirror:

    a. 18-8, type-304, 20-gauge (0.9mm) stainless steel polished to a No. 8 mirror finish.
    b. Mirror: 1/4" (6mm) return concealing 1/4" (6mm) tempered masonite backing.
    c. Four corner countersunk holes provide flush fit of mounting screws with mirror surface.

3. Mount mirror on wall with four #8 oval head screws at points indicated.

    a. 1/8" (3mm) toggle bolts or expansion bolts.

4. Size: 17 ½” inches by 29 ½” inches.

I. TA7 – Double Robe Hook:

1. Basis-of-Design Product: Bobrick B-6727.
2. Description: Surface-mounted unit.
3. Mounting: Surface mounted.
4. Material and Finish: Stainless steel, No. 4 finish (satin).

J. TA8 – Sanitary Napkin Disposal:

1. Basis-of-Design Product: B-254
2. Cabinet: 18-8, type-304, heavy-gauge stainless steel. All-welded construction. Exposed surfaces have satin finish.
3. Door: 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Secured to cabinet with a full-length stainless steel piano-hinge. Equipped with a tumbler lock keyed like other Bobrick washroom accessories.
4. Disposal Panels (2): 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Bottom edges hemmed for safety. Secured to door and permanent panel with spring-loaded, full-length stainless steel piano-hinge. Equipped with international graphic symbol identifying sanitary napkin disposal.
5. Waste Receptacle: Leak-proof, rigid molded polyethylene. Removable for servicing. Capacity: 1.2-gal. (4.6-L).

K. TA9 – Not Used

L. TA10 – Surface-Mounted ADA Electric Hand Dryer:

1. Basis-of-Design Product: Bobrick; B-7128
2. Mounting: Surface-Mounted
3. Voltage: 115V AC
4. Cover Material: 22-gauge galvanized steel with exposed surface type-304 stainless steel with #4 satin-finish vertical grain with UL 94-5VA black plastic trim and side panels.

a. Cover projects no more than 4" (100mm) from wall and is secured to mounting base with two vandal-resistant, recessed hex screws.

5. Mounting Base Material: 20-gauge (1.5mm) plated steel with four 0.236" (6mm) diameter mounting holes.
6. Motor: Universal, 1/7 hp, 8000 rpm, on resilient mounting.
7. Fans: Two balanced, double-inlet centrifugal fans mounted on motor shaft; directs airflow over heating element at 71 cfm.
8. Heating Element: Two coiled nickel-chrome heating elements mounted in mica frame and protected by automatic thermal-overload switches.
9. Electronic Control: Infrared sensor.

M. TA11 – Surface-Mounted Baby Changing Station:

1. Basis-of-Design Product: Koala KB301
2. Mounting: Horizontal Surface-Mounted
3. Color: Gray
4. Support Weight: < 200 lbs
5. Unit Dimensions: 35 15/16″ W x 20 ¾” H (897 mm x 527.5 mm)
6. Depth Closed: 4″ (101.6 mm)
7. Extension Open: 21 3/16″ (539 mm)
8. Install per manufacturer’s instructions in compliance with ADA requirements.

2.3 CUSTODIAL ACCESSORIES

A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product by *Bobrick Washroom Equipment, Inc*., model as indicated for each accessory, or comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bradley Corporation.

C. TA12 – Mop and Broom Holder:

1. Basis-of-Design Product: Bobrick; Model B-223, Mop/Broom Holder.
2. Description: Unit with mop and broom holders.
3. Length: 24 inches.
4. Hooks: Three.
5. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.

a. Accommodate handles from 7/8” to 1 ¼” diameter.

6. Material and Finish: Stainless steel, No. 4 finish (satin).

a. Shelf: Not less than nominal 0.05-inch-thick stainless steel.

2.4 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch 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 minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 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.

2.5 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. Coordinate location of required blocking and reinforcing in substrates of work where accessories are mounted to ensure secure anchorage of accessories.

1. Solid blocking to be provided in metal stud framed walls.

C. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

D. Mirrors: Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

1. Mirror glass to be located no higher than 40 inches above the finished floor surface when measured 24 inches in front of the mirror.

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 instructions.

END OF SECTION 102800

SECTION 104413 - FIRE PROTECTION SPECIALTIES

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. Portable fire extinguishers.
2. Mounting brackets for portable fire extinguishers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Use same designations indicated on Drawings.

1. Portable Fire Extinguishers: Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection devices to include in maintenance manuals.

B. Owners Instruction Manual: Manual that provides condensed instructions and cautions necessary for the installation, operation, inspection, and maintenance of the portable fire extinguishers provided and shall include a copy of NFPA 10 as a source of detailed instruction.

1.5 COORDINATION

A. Coordinate support and/or blocking locations for installation of fire-protection devices.

1.6 WARRANTY – PORTABLE FIRE EXTINGUISHERS

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Project Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Portable Fire Extinguishers NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

Fire Extinguishers: Type, size, and capacity for each mounting bracket indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, provide *JL Industries, Inc.; a division of the Activar Construction Products Group, Model Cosmic 10E*, or comparable product by one of the following:

   a. Guardian Fire Equipment, Inc.
   b. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
   c. Larsens Manufacturing Company.
   d. Moon American.
   e. Nystrom Building Products.
   f. Potter Roemer LLC.

2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4A:80-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS FOR PORTABLE FIRE EXTINGUISHERS NOT IN CABINETS

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. Provide mounting bracket compatible with specified portable fire extinguisher.

2. Basis-of-Design Product: Subject to compliance with requirements, provide *JL Industries, Inc.; a division of the Activar Construction Products Group, Model MB846A (all red including straps)*, or comparable product by one of the following:

    a. Guardian Fire Equipment, Inc.
    b. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
    c. Larsens Manufacturing Company.
    d. Moon American.
    e. Nystrom Building Products.
    f. Potter Roemer LLC.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

    a. Orientation: Vertical.

2.4 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable blocking where extinguishers will be installed.

B. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare mounting brackets as required by type and size of extinguisher specified.

B. Identification: Apply vinyl lettering at locations indicated.

3.3 INSTALLATION – PORTABLE FIRE EXTINGUISHERS

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 45 inches above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

C. Identification: Apply decal lettering at wall mounted bracket locations.

D. Install a portable fire extinguisher at each wall mounted bracket.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection devices are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Touch up marred finishes, or replace fire-protection devices that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by mounting bracket manufacturers.

C. Replace mounting brackets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 130000 – PRE-ENGINEERED OPEN PAVILION STRUCTURE

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. Structural-steel framing.
2. Accessories.

B. Related Requirements:

1. Section 033000 "Cast-In-Place Concrete”.
2. Section 072113 "Asphalt Shingles".

1.3 COORDINATION

A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to pre-engineered building systems including, but not limited to, the following:

a. Condition of foundations and other preparatory work performed by other trades.
b. Structural load limitations.
c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
d. Required tests, inspections, and certifications.
e. Unfavorable weather and forecasted weather conditions and impact on construction schedule.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of pre-engineered building system component.

B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and the following:

1. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
3. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:8):

a. Flashing and trim.
b. Gutters.
c. Downspouts.

C. Samples for Initial Selection: For units with factory-applied finishes.

D. Delegated Design Submittals:

1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTAL

A. Qualification Data: For erector and manufacturer.

B. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

1. Name and location of Project.
2. Order number.
3. Name of manufacturer.
4. Name of Contractor.
5. Building dimensions including width, length, height, and roof slope.
6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
7. Governing building code and year of edition.
8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads.

9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
10. Building-Use Category: Indicate category of building use and its effect on load importance factors.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload and store materials as recommended by the pre-engineered pavilion manufacturer.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

B. Basis-of-design: Pre-engineered single tier rectangular open gable structure as manufactured by Cedar Forest Products (CFP), PO Box 145, West Olive, MI 49460 / 800-552-9495 / info@cedarforestproducts.com

1. Framing members: Tube Steel
2. Overall footprint: See drawing sht. A-102
3. Bay size / quantity: (2) equally spaced bays with center secondary open gable structure
4. Eave height: 11'-8"
5. Columns: Square TS
6. Electrical cutouts and access points: Coordinate quantity and locations with electrical engineer
7. Finish: factory applied epoxy primer with smooth powdercoat finish.
8. Color: black
9. Roof: Architectural asphalt shingles – see specification section 072113
10. Roof decking (exposed underside): ‘Knotwood’ aluminum interlocking cladding system / knotwood.com

    a. Finish: Color / pattern to be selected by the Owner

2.2 ACCESSORIES

A. General: Provide accessories as standard with building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

B. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces and other special pieces as required. Fabricate in minimum 96-inch- (2438-mm-) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

1. Gutter Supports: Fabricated from same material and finish as gutters.
2. Strainers: Aluminum wire ball type at outlets.

C. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; finished to match metal gutters. Fabricate in minimum 10-foot- (3-m-) long sections, complete with formed elbows and offsets.

1. Mounting Straps: Fabricated from same material and finish as gutters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and building system manufacturer's tolerances.

1. Engage land surveyor to perform surveying.

C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

A. Erect pavilion building system according to manufacturer's written instructions and drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing accurately in locations and to elevations indicated. Maintain structural stability of frame during erection.

D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

3.4 ACCESSORY INSTALLATION

A. 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 will be permanently watertight and weather resistant.

B. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from columns and wainscot; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.

1. Tie downspouts to underground drainage system indicated.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.

3.6 CLEANING AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

B. Touchup Painting:

1. After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.

END OF SECTION 130000

ELIZABETHTOWN FREEMAN LAKE PARK SHELTERS PROJECT

Project Manual
Volume 2 of 2
Divisions 21-33

CITY OF ELIZABETHTOWN, KY

December 22, 2023

CMW Project # 21049.05

VOLUME 2 OF 2 – TECHNICAL SPECIFICATIONS

See Volume One for DIVISION 00 through DIVISION 14

TABLE OF CONTENTS – VOLUME TWO

END OF TABLE OF CONTENTS – VOLUME TWO

SECTION 220050 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Escutcheons.
3. Grout.
4. Painting and finishing.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

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 manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

2.4 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Stamped-Steel Type: With spring clips and chrome-plated finish.

C. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.5 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.

L. Sleeves are not required for core-drilled holes.

M. Permanent sleeves are not required for holes formed by removable PE sleeves.

N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

O. Verify final equipment locations for roughing-in.

P. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
1. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
2. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 PAINTING

A. Painting of plumbing systems, equipment, and components is specified in Division 9 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout. Provide forms as required for placement of grout.

C. Avoid air entrapment during placement of grout.

D. Cure placed grout.

END OF SECTION 220050

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER PIPING

A. Above Slab Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ASME B16.23, cast brass or ASME B16.29 wrought copper.
   2. Joints: ASTM B32, solder, Grade 95TA.

B. Below Slab Copper Tubing: ASTM B88, Type K, bendable.
   1. Fittings: ASME B16.23, cast brass or ASME B16.29 wrought copper.
   2. Joints: ASTM B32, solder, Grade 95TA.

2.3 TRANSITION FITTINGS

A. General Requirements:

   1. Same size as pipes to be joined.
   2. Pressure rating at least equal to pipes to be joined.
   3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

C. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

F. Install piping to permit valve servicing.

G. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

K. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

L. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

A. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

E. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.4 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code. Comply with requirements for connection sizes in Division 22 plumbing fixture Sections.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.5 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Division 22 Section "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.6 PIPING SCHEDULE

A. Under-building-slab, domestic water, building-service piping, NPS 3 (DN 80) and smaller , shall be the following:
1. Copper Piping.

B. Aboveground domestic water piping, NPS 2 (DN 50) and smaller, shall be one of the following:
1. Copper Piping

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

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. This Section includes the following domestic water piping specialties:

1. Backflow preventers.
2. Water pressure-reducing valves.
3. Balancing valves.
4. Strainers.
5. Hose bibbs.
6. Wall hydrants.
7. Drain valves.
8. Thermostatic Mixing Valves
9. Water hammer arresters.

B. Related Sections include the following:

1. Division 23 Section "Meters and Gages for Mechanical Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Division 22 Section "Domestic Water Piping" for water meters.
3. Division 22 Section "Drinking Fountains and Water Coolers" for water filters for water coolers.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa), unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. NSF Compliance:

1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 BACKFLOW PREVENTERS

A. Double-Check, Detector-Assembly Backflow Preventers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Ames Co.
      b. Conbraco Industries, Inc.
      c. FEBCO; SPX Valves & Controls.
      d. Watts Industries, Inc.; Water Products Div.
      e. Zurn Plumbing Products Group; Wilkins Div.
   2. Standard: ASSE 1048 and FMG approved or UL listed.
   3. Operation: Continuous-pressure applications.
   4. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.
   5. Body: Cast iron with interior lining complying with AWWA C550 or that is FDA approved.
   6. End Connections: Flanged.
   7. Configuration: Designed for horizontal, straight through flow.
   8. Accessories:
      a. Valves: Outside screw and yoke gate-type with flanged ends on inlet and outlet.
      b. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

B. Copper-Alloy Calibrated Balancing Valves :
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Armstrong International, Inc.
      b. Flo Fab Inc.
      c. ITT Industries; Bell & Gossett Div.
      d. NIBCO INC.
      e. TAC Americas.
      f. Taco, Inc.
      g. Watts Industries, Inc.; Water Products Div.
   2. Type: Ball valve with two readout ports and memory setting indicator.
   3. Body: bronze,
   4. Size: Same as connected piping, but not larger than NPS 2 (DN 50).
   5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.2 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers :

1. Pressure Rating: 125 psig (860 kPa) minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 (DN 65) and larger.
3. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Drain: Factory-installed, hose-end drain valve.

2.3 HOSE BIBBS

A. Hose Bibbs :

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig (860 kPa).
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include wall flange with each chrome- or nickel-plated hose bibb.

2.4 WALL HYDRANTS

A. Nonfreeze Wall Hydrants :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Josam Company.
    b. MIFAB, Inc.
    c. Prier Products, Inc.
    d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    e. Tyler Pipe; Wade Div.
    f. Watts Drainage Products Inc.
    g. Woodford Manufacturing Company.
    h. Zurn Plumbing Products Group; Light Commercial Operation.
    i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig (860 kPa).
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounting with cover.
9. Box and Cover Finish: Stainless Steel.
10. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Operating Keys(s): Two with each wall hydrant.

2.5 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves :

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
3. Size: NPS 3/4 (DN 20).
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.6 THERMOSTATIC MIXING VALVES

A. Water-Temperature Limiting Devices:

B. Primary, Thermostatic, Water Mixing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Armstrong International, Inc.
    b. Lawler Manufacturing Company, Inc.
    c. Leonard Valve Company.
    d. Powers; a division of Watts Water Technologies, Inc.
    e. Symmons Industries, Inc.

2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.
4. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.

2.7 WATER HAMMER ARRESTERS

A. Water Hammer Arresters :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMTROL, Inc.
b. Josam Company.
c. MIFAB, Inc.
d. PPP Inc.
e. Sioux Chief Manufacturing Company, Inc.
f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
g. Tyler Pipe; Wade Div.
h. Watts Drainage Products Inc.
i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 23 Section "Common Work Results for Mechanical" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install water hammer arresters in water piping according to PDI-WH 201.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.4 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

END OF SECTION 221119

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.

C. Hubless, Cast Iron Pipe: ASTM A74, service weight for Grease Line above ground and below ground applications only from vent tee to grease trap inlet. CISPI 302 hubless service weight, CISPI 310 joints with neoprene gaskets, stainless steel clamp and shield assemblies.

D. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

E. Adhesive Primer: ASTM F 656.

1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Solvent Cement: ASTM D 2564.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

I. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends

of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

J. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

K. Install aboveground PVC piping according to ASTM D 2665.

L. Install underground PVC piping according to ASTM D 2321.

M. Plumbing Specialties:

1. Install backwater valves in sanitary waste gravity-flow piping. Comply with requirements for backwater valves specified in Division 22 Section "Sanitary Waste Piping Specialties."
2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Comply with requirements for cleanouts specified in Division 22 Section "Sanitary Waste Piping Specialties."
3. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Division 22 Section "Sanitary Waste Piping Specialties."

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

D. Install supports for vertical PVC piping every 48 inches (1200 mm).

E. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.

3.6 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.9 PIPING SCHEDULE

A. Aboveground, soil and waste piping NPS 4 (DN 100) and smaller shall be any of the following:
   1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

B. Aboveground, vent piping NPS 4 (DN 100) and smaller shall be any of the following:
   1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

C. Underground, soil, waste, and vent piping NPS 4 (DN 100) and smaller shall be any of the following:
   1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

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. This Section includes the following sanitary drainage piping specialties:

1. Cleanouts.
2. Floor drains.
3. Roof flashing assemblies.
4. Miscellaneous sanitary drainage piping specialties.
5. Flashing materials.

B. Related Sections include the following:

1. Division 22 Section "Storm Drainage Piping Specialties" for trench drains for storm water and roof drains.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1. Cleanouts.
2. Floor Drains.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

1.5 COORDINATION

A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts :

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
5. Closure: Countersunk plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts :

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Josam Company; Josam Div.
    b. Oatey.
    c. Sioux Chief Manufacturing Company, Inc.
    d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    e. Tyler Pipe; Wade Div.
    f. Watts Drainage Products Inc.
    g. Zurn Plumbing Products Group; Light Commercial Operation.
    h. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for cast-iron soil pipe with cast-iron ferrulethreaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Cast-iron soil pipe with cast-iron ferruleThreaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Not required.
7. Outlet Connection: Inside calk.
8. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
9. Frame and Cover Shape: Round.
10. Top Loading Classification: Medium Duty.

11. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
12. Standard: ASME A112.3.1.
13. Size: Same as connected branch.

C. Cast-Iron Wall Cleanouts :

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
5. Closure: Countersunk plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, stainless-steel cover plate with screw.

2.2 FLOOR DRAINS

A. Floor Drains :

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Commercial Enameling Co.
    b. Josam Company; Josam Div.
    c. MIFAB, Inc.
    d. Prier Products, Inc.
    e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    f. Tyler Pipe; Wade Div.
    g. Watts Drainage Products Inc.
    h. Zurn Plumbing Products Group; Light Commercial Operation.
    i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Description: Refer to schedule on drawings.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies :

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. Acorn Engineering Company; Elmdor/Stoneman Div.
    b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch-(1.6-mm-) thick, lead flashing collar and skirt extending at least 6 inches (150 mm) from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains :

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Deep-Seal Traps :

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

    a. NPS 2 (DN 50): 4-inch- (100-mm-) minimum water seal.
    b. NPS 2-1/2 (DN 65) and Larger: 5-inch- (125-mm-) minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings :

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 (DN 15) side inlet.

D. Floor-Drain, Trap Seal: a. Pro Set Systems, Inc.

2.5 FLASHING MATERIALS

A. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft. (3.7 kg/sq. m or 0.41-mm thickness).
2. Vent Pipe Flashing: 8 oz./sq. ft. (2.5 kg/sq. m or 0.27-mm thickness).

B. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

C. Solder: ASTM B 32, lead-free alloy.

D. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 23 Section "Common Work Results for Mechanical" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

H. Assemble open drain fittings and install with top of hub 2 inches (51 mm) above floor.

I. Install deep-seal traps on floor drains and other waste outlets, if indicated.

J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

K. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

L. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

M. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 223300 - ELECTRIC DOMESTIC WATER HEATERS

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. This Section includes the following electric water heaters:
   1. Commercial, storage electric water heaters.
   2. Compression tanks.
   3. Water heater accessories.

1.3 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Product Certificates: For each type of commercial and instantaneous electric water heater, signed by product manufacturer.

D. Source quality-control test reports.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For electric water heaters to include in emergency, operation, and maintenance manuals.

G. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

C. 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.

D. ASME Compliance: Where indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

E. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.

1.5 COORDINATION

A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period(s): From date of Substantial Completion:

a. Instantaneous Electric Water Heaters: Five year(s).

b. Commercial Electric Water Heaters:

1) Storage Tank: Five years.
2) Controls and Other Components: Five years.

c. Compression Tanks: One year(s).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 COMMERCIAL ELECTRIC WATER HEATERS

A. Commercial, Storage Electric Water Heaters: Comply with UL 1453 requirements for storage-tank-type water heaters.

1. Manufacturers:

   a. Bradford White Corporation.
   b. Lochinvar.
   c. Smith, A. O. Water Products Company.
   d. State Industries, Inc.

2. Storage-Tank Construction: Non-ASME-code, steel vertical arrangement.

   a. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.

      1) NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1.
      2) NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.

   b. Pressure Rating: 150 psig (1035 kPa).
   c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

3. Factory-Installed Storage-Tank Appurtenances:

   a. Anode Rod: Replaceable magnesium.
   b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
   c. Insulation: Comply with ASHRAE/IESNA 90.1.
   d. Jacket: Steel with enameled finish.
   e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.
   f. Temperature Control: Adjustable thermostat.
   g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
   h. Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3, for combination temperature and pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

4. Special Requirements: NSF 5 construction.
5. Building Automation System Interface: Normally closed dry contacts for enabling and disabling water heater.
6. Capacity and Characteristics:

   a. Refer to schedule on drawings.

2.3 COMPRESSION TANKS

A. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

1. Manufacturers:

a. AMTROL Inc.
b. Armstrong Pumps, Inc.
c. Smith, A. O.; Aqua-Air Div.
d. State Industries, Inc.
e. Taco, Inc.
f. Watts Regulator Co.
g. Wessels Co.

2. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

3. Capacity and Characteristics:

a. Refer to schedule on drawings.

2.4 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

B. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4 (DN 20).

C. Piping Manifold Kits: Water heater manufacturer's factory-fabricated inlet and outlet piping arrangement for multiple-unit installation. Include piping and valves for field assembly that are capable of isolating each water heater and of providing balanced flow through each water heater.

2.5 SOURCE QUALITY CONTROL

A. Test and inspect water heater storage tanks, specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial water heater storage tanks before shipment to minimum of one and one-half times pressure rating.

C. Prepare test reports.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases.
   1. Concrete base construction requirements are specified in Division 23 Section "Common Work Results for Mechanical Systems."

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

D. Install combination temperature and pressure relief valves in water piping for water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

E. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.

F. Install thermometer on outlet piping of water heaters. Refer to Division 23 Section "Meters and Gages" for thermometers.

G. Install thermometers on inlet and outlet piping of household, collector-to-tank, solar-electric water heaters. Refer to Division 23 Section "Meters and Gages" for thermometers.

H. Install pressure gage(s) on inlet and outlet of commercial electric water- heater piping. Refer to Division 23 Section "Meters and Gages" for pressure gages.

I. Assemble and install inlet and outlet piping manifold kits for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each water heater. Include shutoff valve, thermometer in each water heater inlet and outlet, and throttling valve in each water heater outlet. Refer to Division 23 Section "General-Duty

Valves for Plumbing Piping" for general-duty valves and to Division 23 Section "Meters and Gages for Plumbing Piping" for thermometers.

J. Fill water heaters with water.

K. Charge compression tanks with air.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial and instantaneous electric water heaters. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 223300

SECTION 224000 - PLUMBING FIXTURES

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. This Section includes the following conventional plumbing fixtures and related components:

1. Faucets for lavatories and sinks.
2. Flushometers.
3. Toilet seats.
4. Fixture supports.
5. Water closets.
6. Urinals.
7. Lavatories.
8. Sinks.
9. Mop basins.

B. Related Sections include the following:
1. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.
2. Division 22 Section "Drinking Fountains and Water Coolers."

1.3 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

C. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

D. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

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. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

G. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
2. Slip-Resistant Bathing Surfaces: ASTM F 462.
3. Stainless-Steel Commercial, Handwash Sinks: NSF 2 construction.
4. Stainless-Steel Residential Sinks: ASME A112.19.3.
5. Vitreous-China Fixtures: ASME A112.19.2M.
6. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
7. Water-Closet, Flushometer Tank Trim: ASSE 1037.

H. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
4. Faucets: ASME A112.18.1.
5. Hose-Connection Vacuum Breakers: ASSE 1011.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
8. NSF Potable-Water Materials: NSF 61.
9. Pipe Threads: ASME B1.20.1.
10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
11. Supply Fittings: ASME A112.18.1.
12. Brass Waste Fittings: ASME A112.18.2.

I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Manual-Operation Flushometers: ASSE 1037.
4. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.

J. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Flexible Water Connectors: ASME A112.18.6.
2. Floor Drains: ASME A112.6.3.
3. Grab Bars: ASTM F 446.
4. Hose-Coupling Threads: ASME B1.20.7.
5. Off-Floor Fixture Supports: ASME A112.6.1M.
6. Pipe Threads: ASME B1.20.1.
7. Plastic Toilet Seats: ANSI Z124.5.
8. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

A. Lavatory Faucets:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard Companies, Inc.
b. Bradley Corporation.
c. Chicago Faucets.
d. Delta Faucet Company.

e. Eljer.
f. Elkay Manufacturing Co.
g. Grohe America, Inc.
h. Kohler Co.
i. Speakman Company.
j. Zurn Plumbing Products Group; Commercial Brass Operation.

2. Description: Refer to schedule on drawings.

2.2 SINK FAUCETS

A. Sink Faucets:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard Companies, Inc.
b. Bradley Corporation.
c. Chicago Faucets.
d. Delta Faucet Company.
e. Eljer.
f. Elkay Manufacturing Co.
g. Grohe America, Inc.
h. Kohler Co.
i. Speakman Company.
j. Zurn Plumbing Products Group; Commercial Brass Operation.

2. Description: Refer to schedule on drawings.

2.3 FLUSHOMETERS

A. Flushometers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Coyne & Delany Co.
b. Delta Faucet Company.
c. Sloan Valve Company.
d. Zurn Plumbing Products Group; Commercial Brass Operation.
e. TOTO USA, Inc.

2. Description: Refer to schedule on drawings.

2.4 TOILET SEATS

A. Toilet Seats:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard Companies, Inc.
b. Bemis Manufacturing Company.
c. Church Seats.
d. Eljer.
e. Kohler Co.
f. Olsonite Corp.

2. Description: Refer to schedule on drawings

2.5 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Engineered Brass Co.
b. McGuire Manufacturing Co., Inc.
c. Plumberex Specialty Products Inc.
d. TCI Products.
e. TRUEBRO, Inc.
f. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.

2. Description: Refer to schedule on drawings.

2.6 FIXTURE SUPPORTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Company.
2. MIFAB Manufacturing Inc.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
6. Zurn Plumbing Products Group; Specification Drainage Operation.

B. Water-Closet Supports:

1. Description: Combination carrier designed for accessible or standard mounting height of wall-mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

C. Urinal Supports:

1. Description: Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture for wall-mounting, urinal-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

D. Lavatory Supports:

1. Description: Type I, lavatory carrier with exposed arms and tie rods II, lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

2.7 WATER CLOSETS

A. Water Closets:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Standard Companies, Inc.
   b. Eljer.
   c. Kohler Co.
   d. TOTO USA, Inc.

2. Description: Refer to schedule on drawings.

2.8 URINALS

A. Urinals:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Standard Companies, Inc.
   b. Eljer.
   c. Kohler Co.
   d. Mansfield Plumbing Products, Inc.
   e. TOTO USA, Inc.

2. Description: Refer to schedule on drawings.

2.9 LAVATORIES

A. Lavatories:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Standard Companies, Inc.
   b. Eljer.
   c. Kohler Co.

d. Mansfield Plumbing Products, Inc.
e. TOTO USA, Inc.

2. Description: Refer to schedule on drawings.

2.10 SINKS

A. Sinks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Eljer.
b. Kohler Co.
c. American Standard Companies, Inc.
d. Mansfield Plumbing Products, Inc.
e. DuPont, Corian Products.
f. Formica Corporation.
g. Wilsonart International.
h. Elkay Manufacturing Co.

2. Description: Refer to schedule on drawings.

2.11 MOP BASINS

A. Mop Basins:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company.
b. Crane Plumbing, L.L.C./Fiat Products.
c. Precast Terrazzo Enterprises, Inc.
d. Stern-Williams Co., Inc.
e. Zurn Plumbing Products Group; Light Commercial Operation.

2. Description: Refer to schedule on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 23 Section "General-Duty Valves for Mechanical Piping."

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install toilet seats on water closets.

N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

O. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

P. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

Q. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

R. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings.

S. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust controls. Replace damaged and malfunctioning units and controls.

C. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

D. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224000

SECTION 224700 - DRINKING FOUNTAINS AND WATER COOLERS

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. This Section includes the following water coolers and related components:

1. Pressure water coolers.
2. Fixture supports.

1.3 DEFINITIONS

A. Accessible Water Cooler: Fixture that can be approached and used by people with disabilities.

B. Water Cooler: Electrically powered fixture for generating and delivering cooled drinking water.

1.4 SUBMITTALS

A. Product Data: For each fixture indicated. Include rated capacities, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For fixtures to include in emergency, operation, and maintenance manuals.

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. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities “Public Law 101-336, "Americans with Disabilities Act" ; for fixtures for people with disabilities.

C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

D. ARI Standard: Comply with ARI's "Directory of Certified Drinking Water Coolers" for style classifications.

E. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.

F. ASHRAE Standard: Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant, unless otherwise indicated.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filter Cartridges: Equal to 100% percent of amount installed for each type and size indicated, but no fewer than one of each.

PART 2 - PRODUCTS

2.1 PRESSURE WATER COOLERS

A. Water Coolers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Elkay Manufacturing Co.
b. Halsey Taylor.
c. Haws Corporation.
d. Oasis Corporation.
e. Sunroc Corp.

2. Description: Refer to schedule on drawings.

2.2 FIXTURE SUPPORTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Co.
2. MIFAB Manufacturing, Inc.

3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
6. Zurn Plumbing Products Group; Specification Drainage Operation.

B. Description: ASME A112.6.1M, water cooler carriers. Include vertical, steel uprights with feet and tie rods and bearing plates with mounting studs matching fixture to be supported.

1. Type I: Hanger-type carrier with two vertical uprights.
2. Type II: Bilevel, hanger-type carrier with three vertical uprights.
3. Supports for Accessible Fixtures: Include rectangular, vertical, steel uprights instead of steel pipe uprights.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before fixture installation. Verify that sizes and locations of piping and types of supports match those indicated.

B. Examine walls and floors for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Use carrier off-floor supports for wall-mounting fixtures, unless otherwise indicated.

B. Use mounting frames for recessed water coolers, unless otherwise indicated.

C. Set remote water cooling unit on field fabricated steel frame, unless otherwise indicated.

D. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view. Plain copper tube, fittings, and valves may be used in concealed locations.

3.3 INSTALLATION

A. Install off-floor supports affixed to building substrate and attach wall-mounting fixtures, unless otherwise indicated.

B. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.

C. Install fixtures level and plumb. For fixtures indicated for children, install at height required by authorities having jurisdiction.

D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Division 23 Section "General-Duty Valves for Mechanical Piping."

E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

F. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Escutcheons are specified in Division 23 Section "Common Work Results for Mechanical."

G. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.5 FIELD QUALITY CONTROL

A. Water Cooler Testing: After electrical circuitry has been energized, test for compliance with requirements. Test and adjust controls and safeties.

1. Remove and replace malfunctioning units and retest as specified above.
2. Report test results in writing.

3.6 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

B. Adjust water cooler temperature settings.

3.7 CLEANING

A. After completing fixture installation, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

END OF SECTION 224700

SECTION 230500 - COMMON WORK RESULTS FOR MECHANICAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.
10. Concrete bases.
11. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.
2. Mechanical sleeve seals.
3. Escutcheons.

B. Welding certificates.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

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 manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F ,

1. Available Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Eclipse, Inc.
d. Epco Sales, Inc.
e. Hart Industries, International, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

1. Available Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Available Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:

a. Calpico, Inc.
b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:

a. Perfection Corp.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.
d. Victaulic Co. of America.

2.5 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Available Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

2.7 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

E. One-Piece, Stamped-Steel Type: With set screw and chrome-plated finish.

F. One-Piece, Floor-Plate Type: Cast-iron floor plate.

2.8 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type with spring clips.
d. Bare Piping at Wall, ceiling and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
e. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
f. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
g. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
    b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
    c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

        1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint.

O. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

R. Verify final equipment locations for roughing-in.

S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. 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 the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1.

3.7 GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 230500

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR MECHANICAL EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in mechanical equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230529 - HANGERS AND SUPPORTS FOR MECHANICAL PIPING AND EQUIPMENT

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 hangers and supports for mechanical systems:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Equipment supports.
10. Outdoor smoke evacuation ductwork support.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 21 Section "Water-Based Fire-Suppression Systems" for pipe hangers for fire-protection piping.
3. Division 23 Section "Expansion Fittings and Loops for mechanical Piping" for pipe guides and anchors.
4. Division 23 Section(s) "Metal Ducts " for duct hangers and supports.

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Fiberglass pipe hangers.
3. Thermal-hanger shield inserts.
4. Powder-actuated fastener systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Fiberglass strut systems. Include Product Data for components.
4. Pipe stands. Include Product Data for components.
5. Equipment supports.
6. Ductwork supports.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Available Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.

11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Available Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.

4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with vapor barrier.

D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2.6 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping. Makeshift pipe stands and supports of lumber, masonry units, etc. are not acceptable – NO EXCEPTIONS.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

1. Available Manufacturers:

a. ERICO/Michigan Hanger Co.
b. MIRO Industries.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

1. Available Manufacturers:

a. MIRO Industries.

D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Available Manufacturers:

a. ERICO/Michigan Hanger Co.
b. MIRO Industries.
c. Portable Pipe Hangers.

2. Base: Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Available Manufacturers:

a. Portable Pipe Hangers.

2. Bases: One or more plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.

3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 (DN 15 to DN 600), if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8 (DN 20 to DN 200).
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).
10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8 (DN 10 to DN 200).
11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3 (DN 10 to DN 80).
12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
16. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36 (DN 65 to DN 900), if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20 (DN 65 to DN 500), from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24 (DN 50 to DN 600), if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30 (DN 50 to DN 750), if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).

c. Heavy (MSS Type 33): 3000 lb (1360 kg).

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

a. Horizontal (MSS Type 54): Mounted horizontally.
b. Vertical (MSS Type 55): Mounted vertically.
c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Fiberglass Pipe Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled fiberglass struts.

F. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

G. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

H. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Section "Roof Accessories" for curbs.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

K. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

L. Install lateral bracing with pipe hangers and supports to prevent swaying.

M. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

N. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

O. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

P. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and 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. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

END OF SECTION 230529

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

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. This Section includes TAB to produce design objectives for the following:

1. Air Systems:

a. Constant-volume air systems.

2. Verifying that automatic control devices are functioning properly.
3. Reporting results of activities and procedures specified in this Section.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.

D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

E. NC: Noise criteria.

F. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

G. RC: Room criteria.

H. Report Forms: Test data sheets for recording test data in logical order.

I. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

J. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

K. TAB: Testing, adjusting, and balancing.

L. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

M. Test: A procedure to determine quantitative performance of systems or equipment.

N. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.4 SUBMITTALS

A. Qualification Data: Within 10 days from Contractor's Notice to Proceed, submit 2 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Certified TAB Reports: Submit three copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

C. Warranties specified in this Section.

1.5 QUALITY ASSURANCE

~~A.~~ TAB Firm Qualifications: Engage a TAB firm certified by AABC or NEBB, whose sole business is to perform testing, adjusting, and balancing services.

B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems." NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

D. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems".

E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.8 WARRANTY

A. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 01 Section "Project Record Documents."

D. Examine equipment performance data including fan curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

F. Examine system and equipment test reports.

G. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

H. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

I. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine equipment for installation and for properly operating safety interlocks and controls.

K. Examine automatic temperature system components to verify the following:

1. Dampers and other controlled devices are operated by the intended controller.
2. Dampers are in the position indicated by the controller.
3. Integrity of dampers for free and full operation and for tightness of fully closed and fully open positions.
4. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
5. Sensors are located to sense only the intended conditions.
6. Sequence of operation for control modes is according to the Contract Documents.
7. Controller set points are set at indicated values.
8. Interlocked systems are operating.
9. Changeover from heating to cooling mode occurs according to indicated values.

L. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.
5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
6. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials

identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

C. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

E. Verify that motor starters are equipped with properly sized thermal protection.

F. Check dampers for proper position to achieve desired airflow path.

G. Check for airflow blockages.

H. Check condensate drains for proper connections and functioning.

I. Check for proper sealing of air-handling unit components.

J. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
b. Measure static pressure directly at the fan outlet or through the flexible connection.

c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
4. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.

2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

3.7 PROCEDURES FOR TEMPERATURE MEASUREMENTS

A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

3.8 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Check free travel and proper operation of control devices such as damper and valve operators.

F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.

G. Check the interaction of electrically operated switch transducers.

H. Check the interaction of interlock and lockout systems.

I. Check main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.9 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: 0 to minus 10 percent.
3. Cooling Water Flow Rate: 0 to minus 5 percent.

3.10 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.

3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Fan drive settings including settings and percentage of maximum pitch diameter.
    d. Other system operating conditions that affect performance.

D. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and size.
    e. Manufacturer's serial number.
    f. Arrangement and class.
    g. Sheave make, size in inches (mm), and bore.
    h. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).

2. Motor Data:

    a. Make and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches (mm), and bore.

f. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
g. Number of belts, make, and size.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Suction static pressure in inches wg (Pa).

E. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling unit number.
b. Location and zone.
c. Traverse air temperature in deg F (deg C).
d. Duct static pressure in inches wg (Pa).
e. Duct size in inches (mm).
f. Duct area in sq. ft. (sq. m).
g. Indicated airflow rate in cfm (L/s).
h. Indicated velocity in fpm (m/s).
i. Actual airflow rate in cfm (L/s).
j. Actual average velocity in fpm (m/s).
k. Barometric pressure in psig (Pa).

F. Air-to-Air Heat-Recovery Unit Reports:

1. Unit Data:

a. Unit identification.
b. Location.
c. Service.
d. Make and type.
e. Model and serial numbers.

2. Motor Data:

a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full load amperage and service factor.
e. Sheave make, size in inches (mm), and bore.
f. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).

3. If fans are an integral part of the unit, include the following for each fan:

a. Make and type.
b. Arrangement and size.
c. Sheave make, size in inches (mm), and bore.
d. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).

4. Test Data (Indicated and Actual Values):

a. Total exhaust airflow rate in cfm (L/s).
b. Purge exhaust airflow rate in cfm (L/s).
c. Outside airflow rate in cfm (L/s).
d. Total exhaust fan static pressure in inches wg (Pa).
e. Total outside-air fan static pressure in inches wg (Pa).
f. Pressure drop on each side of recovery wheel in inches wg (Pa).
g. Exhaust air temperature entering in deg F (deg C).
h. Exhaust air temperature leaving in deg F (deg C).
i. Outside-air temperature entering in deg F (deg C).
j. Outside-air temperature leaving in deg F (deg C).
k. Calculate sensible and total heat capacity of each airstream in MBh (kW).

3.12 ADDITIONAL TESTS

A. Within 15 days of completing original TAB, anticipate to perform one additional testing and balancing to verify that non-compliance equipment, device, or material installation has been corrected.

END OF SECTION 230593

SECTION 230700 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:

   a. Flexible elastomeric.
   b. Mineral fiber.
   c. Phenolic.

2. Insulating cements.
3. Adhesives.
4. Sealants.
5. Field-applied jackets.
6. Tapes.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for Mechanical Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain

clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

D. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; All-Service Duct Wrap.

E. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. CertainTeed Corp.; Commercial Board.
    b. Fibrex Insulations Inc.; FBX.
    c. Johns Manville; 800 Series Spin-Glas.
    d. Knauf Insulation; Insulation Board.
    e. Manson Insulation Inc.; AK Board.
    f. Owens Corning; Fiberglas 700 Series.

F. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Fibrex Insulations Inc.; Coreplus 1200.
    b. Johns Manville; Micro-Lok.
    c. Knauf Insulation; 1000 Pipe Insulation.
    d. Manson Insulation Inc.; Alley-K.
    e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

G. Phenolic:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Kingspan Corp.; Koolphen K.

2. Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.
3. Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.
4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
5. Factory-Applied Jacket: Requirements are specified in "Factory-Applied Jackets" Article.

    a. Preformed Pipe Insulation: ASJ.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Insulco, Division of MFS, Inc.; Triple I.
    b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. P. K. Insulation Mfg. Co., Inc.; Thermal-V-Kote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Aeroflex USA Inc.; Aeroseal.
    b. Armacell LCC; 520 Adhesive.
    c. Foster Products Corporation, H. B. Fuller Company; 85-75.
    d. RBX Corporation; Rubatex Contact Adhesive.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Childers Products, Division of ITW; CP-82.
    b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    d. Marathon Industries, Inc.; 225.
    e. Mon-Eco Industries, Inc.; 22-25.

D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Childers Products, Division of ITW; CP-82.
    b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    d. Marathon Industries, Inc.; 225.
    e. Mon-Eco Industries, Inc.; 22-25.

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Dow Chemical Company (The); 739, Dow Silicone.
    b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
    c. P.I.C. Plastics, Inc.; Welding Adhesive.
    d. Red Devil, Inc.; Celulon Ultra Clear.
    e. Speedline Corporation; Speedline Vinyl Adhesive.

2.4 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Phenolic Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-76.
   b. Foster Products Corporation, H. B. Fuller Company; 30-45.
   c. Marathon Industries, Inc.; 405.
   d. Mon-Eco Industries, Inc.; 44-05.
   e. Pittsburgh Corning Corporation; Pittseal 444.
   f. Vimasco Corporation; 750.

2. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

2. Childers Products, Division of ITW; CP-76-8.

   a. Foster Products Corporation, H. B. Fuller Company; 95-44.
   b. Marathon Industries, Inc.; 405.
   c. Mon-Eco Industries, Inc.; 44-05.
   d. Vimasco Corporation; 750.

3. Materials shall be compatible with insulation materials, jackets, and substrates.
4. Fire- and water-resistant, flexible, elastomeric sealant.
5. Service Temperature Range: Minus 40 to plus 250 deg F.
6. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:
2. Childers Products, Division of ITW; CP-76.
3. Materials shall be compatible with insulation materials, jackets, and substrates.
4. Fire- and water-resistant, flexible, elastomeric sealant.
5. Service Temperature Range: Minus 40 to plus 250 deg F.
6. Color: White.

2.5 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

2. Johns Manville; Zeston.

    a. P.I.C. Plastics, Inc.; FG Series.
    b. Proto PVC Corporation; LoSmoke.
    c. Speedline Corporation; SmokeSafe.

3. Adhesive: As recommended by jacket material manufacturer.
4. Color: White.
5. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

6. Factory-fabricated tank heads and tank side panels.

C. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:

2. Childers Products, Division of ITW; Metal Jacketing Systems.

    a. PABCO Metals Corporation; Surefit.
    b. RPR Products, Inc.; Insul-Mate.

3. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.

    a. Factory cut and rolled to size.
    b. Finish and thickness are indicated in field-applied jacket schedules.
    c. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
    c. Factory-Fabricated Fitting Covers:

        1) Same material, finish, and thickness as jacket.
        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        3) Tee covers.
        4) Flange and union covers.
        5) End caps.
        6) Beveled collars.
        7) Valve covers.
        8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.6 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:
2. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.

a. Compac Corp.; 104 and 105.
b. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
c. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

3. Width: 3 inches.
4. Thickness: 11.5 mils.
5. Adhesion: 90 ounces force/inch in width.
6. Elongation: 2 percent.
7. Tensile Strength: 40 lbf/inch in width.
8. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:
2. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.

a. Compac Corp.; 130.
b. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
c. Venture Tape; 1506 CW NS.

3. Width: 2 inches.
4. Thickness: 6 mils.
5. Adhesion: 64 ounces force/inch in width.
6. Elongation: 500 percent.
7. Tensile Strength: 18 lbf/inch in width.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:
2. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.

a. Compac Corp.; 120.
b. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
c. Venture Tape; 3520 CW.

3. Width: 2 inches.
4. Thickness: 3.7 mils.
5. Adhesion: 100 ounces force/inch in width.
6. Elongation: 5 percent.
7. Tensile Strength: 34 lbf/inch in width.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations.

Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.6 FINISHES

A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Do not field paint aluminum or stainless-steel jackets.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

3.8 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply, outdoor and make-up air.
2. Indoor, exposed supply, outdoor and make-up air.
3. Indoor, concealed return located in nonconditioned space.
4. Indoor, exposed return located in nonconditioned space.
5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
7. Outdoor, concealed supply, return, outdoor and make-up air.
8. Outdoor, exposed supply, return, outdoor and make-up air.

B. Items Not Insulated:

1. Factory-insulated flexible ducts.
2. Factory-insulated plenums and casings.
3. Flexible connectors.
4. Vibration-control devices.
5. Factory-insulated access panels and doors.

3.9 INDOOR DUCT INSULATION SCHEDULE

A. Mineral-Fiber Blanket: 2 inches (38mm) thick and 0.75-lb/cu. Ft. (12-kg/cu.m) nominal density shall be used on the following:

1. Concealed or exposed, round, flat-oval and rectangular supply.
2. Concealed or exposed, round, flat-oval and rectangular return.
3. Concealed or exposed, round, flat-oval and rectangular outside air and make-up air.

3.10 MECHANICAL SYSTEM AND PLUMBING PIPING INSULATION SCHEDULE

A. Flexible Elastomeric: 3/4 inch thick shall be used on the following:

1. Condensate drains

2. Domestic cold, hot and hot water recirculation piping

B. Flexible Elastomeric: 1 inch thick shall be used on the following:

1. Storm drains and roof drain bodies of 4” diameter or less.

C. Mineral Fiber, Preformed Pipe, Type I: 1 inch thick shall be used on the following:

1. Storm drains and roof drain bodies greater than 4” diameter.

D. Flexible Elastomeric; shall be used on the following:

a. Refrigerant piping, 1” and less: Use 3/4” thick insulation.

b. Refrigerant piping, over 1”: Use 1” thick insulation.

3.11 FIRE PROTECTION PIPING INSULATION SCHEDULE

1. Where indicated on contract drawings, all pipe sizes: Insulation shall be one of the following:

a. Cellular Glass: 2 inches thick.
b. Mineral-Fiber, Preformed Pipe, Type I or II: 2 inches thick.

3.12 FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Ducts and Plenums, exposed:

1. None.

C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. Aluminum, Smooth: 0.020 inch thick. For use on above ceilings in return air plenum as indicated on the contract drawings.

2. PVC: 30 mils thick. PVC jackets shall not be used on any piping system within a return air plenum.

END OF SECTION 230700

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section “Hangers and Supports for Mechanical Piping and Equipment”.
3. Section 230700 “Mechanical Insulation”, exterior wrapped only for supply & return ductwork. Interior lined insulation is not acceptable.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for

static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Lindab Inc.
    b. McGill AirFlow LLC.
    c. Sheet Metal Connectors, Inc.
    d. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 (Z180).
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 3 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.

3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 SEAM AND JOINT SEALING

A. Seal duct seams and joints for duct static-pressure and leakage classes specified in "Performance Requirements" Article, according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements," unless otherwise indicated.

3.3 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.4 PAINTING

A. Paint interior of metal ducts that are visible through registers and. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

    a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

C. Duct system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel.

B. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

C. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

    a. Velocity 1000 fpm or Lower: 90-degree tap.
    b. Velocity 1000 to 1500 fpm: Conical tap.
    c. Velocity 1500 fpm or Higher: 45-degree lateral.

D. Ductwork shall be constructed to SMACNA Duct Standards for Low Pressure ductwork with 2 inch WG positive or negative static pressure.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Fire dampers.
4. Duct-mounted access doors.
5. Flexible connectors.
6. Flexible ducts.
7. Duct accessory hardware.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors.
d. Duct security bars.
e. Wiring Diagrams: For power, signal, and control wiring.

C. Source quality-control reports.

D. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 (Z180).
2. Exposed-Surface Finish: Mill phosphatized.

C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Nailor Industries Inc.
6. NCA Manufacturing, Inc.
7. Pottorff; a division of PCI Industries, Inc.
8. Ruskin Company.
9. Vent Products Company, Inc.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm.

D. Maximum System Pressure: 1-inch wg.

E. Frame: 0.052-inch- thick, galvanized sheet steel 0.063-inch- (1.6-mm-) thick extruded aluminum, with welded corners and mounting flange.

F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch (150-mm) width, 0.025-inch- (0.6-mm-) thick, roll-formed aluminum 0.050-inch- (1.2-mm-) thick aluminum sheet with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Vinyl foam.

I. Blade Axles:

1. Material: Nonferrous metal Aluminum.
2. Diameter: 0.20 inch.

J. Tie Bars and Brackets: Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball or synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Front of rear screens.
6. 90-degree stops.

N. Sleeve: Minimum 20-gage thickness.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. Flexmaster U.S.A., Inc.
d. McGill AirFlow LLC.

e. METALAIRE, Inc.
f. Nailor Industries Inc.
g. Pottorff; a division of PCI Industries, Inc.
h. Ruskin Company.
i. Trox USA Inc.
j. Vent Products Company, Inc.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

a. Hat-shaped, galvanized steel channels, 0.064-inch minimum thickness.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

a. Oil-impregnated bronze.
b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. Flexmaster U.S.A., Inc.
d. McGill AirFlow LLC.
e. METALAIRE, Inc.
f. Nailor Industries Inc.
g. Pottorff; a division of PCI Industries, Inc.
h. Ruskin Company.
i. Trox USA Inc.
j. Vent Products Company, Inc.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.

4. Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
    e. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.

6. Blade Axles: Nonferrous metal.
7. Bearings:

    a. Oil-impregnated bronze.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Aluminum.

2.4 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.
6. METALAIRE, Inc.
7. Nailor Industries Inc.
8. NCA Manufacturing, Inc.
9. PHL, Inc.
10. Pottorff; a division of PCI Industries, Inc.
11. Prefco; Perfect Air Control, Inc.
12. Ruskin Company.
13. Vent Products Company, Inc.
14. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Type: Static rated and labeled according to UL 555 by an NRTL.

C. Fire Rating: 1-1/2 hours.

D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.

H. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.5 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Ventfabrics, Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to 2 strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

2.6 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Noninsulated, Flexible Duct: UL 181, Class 0, interlocking spiral of aluminum foil.

1. Pressure Rating: 8-inch wg positive or negative.
2. Maximum Air Velocity: 5000 fpm.
3. Temperature Range: Minus 100 to plus 435 deg F.

C. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.

D. Flexible Duct Connectors:

1. Clamps: Nylon strap in sizes 3 through 18 inches, to suit duct size.

2.7 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Coordinate subparagraphs below with Division 23 Section "Metal Ducts." Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire dampers according to UL listing.

H. Install flexible connectors to connect ducts to equipment.

I. Connect diffusers boots to low-pressure ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

J. Connect flexible ducts to metal ducts with draw bands.

K. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Operate fire dampers to verify full range of movement and verify that proper heat-response device is installed.
3. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300

SECTION 233713 – GRILLES, REGISTERS, AND DIFFUSERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.
2. Perforated diffusers.
3. Louver face diffusers.
4. Linear bar diffusers.
5. Linear bar grilles.
6. Duct mounted grilles. Include rake off accessory.

B. Related Sections:

1. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers: Refer to schedule on drawings.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following

a. Anemostat Products; a Mestek company.
b. Carnes.
c. Krueger.

d. METALAIRE, Inc.
e. Nailor Industries Inc.
f. Price Industries.
g. Titus.

2. Material: Aluminum.
3. Finish: Baked enamel, color by Owner.
4. Accessories:

a. Plaster ring.
b. Dampers.

B. Louver Face Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anemostat Products; a Mestek company.
b. Carnes.
c. Krueger.
d. METALAIRE, Inc.
e. Price Industries.
f. Titus.

2. Material: Aluminum.
3. Finish: Baked enamel, color by Owner.
4. Accessories:

a. Square to round neck adaptor.
b. Plaster ring.
c. Dampers.

2.2 REGISTERS AND GRILLES

A. Adjustable Bar Register:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anemostat Products; a Mestek company.
b. Carnes.
c. Krueger.
d. METALAIRE, Inc.
e. Price Industries.
f. Titus.

2. Material: Aluminum.
3. Finish: Baked enamel; color by Owner.
4. Damper Type: Adjustable opposed blade.

B. Duct Mounted Grilles and Registers

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anemostat Products; a Mestek company.
b. Carnes.
c. Krueger.
d. METALAIRE, Inc.
e. Price Industries.
f. Titus.

2. Material: Steel.
3. Finish: Baked enamel; color by Owner.
4. Damper Type: Adjustable opposed blade.
5. Accessories:

a. Integral air scoop.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 260000 - ELECTRICAL GENERAL PROVISIONS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide labor, equipment, materials, supplies and components, and perform all operations necessary for installation of complete electrical system.

B. It is not the intent of this section to make any Contractor, other than the General Contractor alone, the single responsible party to the Owner. All transactions such as submittal of shop drawings, claims for extra costs, requests for equipment or materials substitution, shall be done through the General Contractor. No attempt has been made to arbitrarily assign responsibility of work, material, equipment or services to a particular trade or Contractor. Unless stated otherwise, subdivision and assignment of work shall be General Contractor's responsibility.

C. Facilities and systems of electrical work are described, but not limited to the following:

1. Complete demolition and removal of existing.
2. Temporary relocation of services and utilities necessary for phasing of construction work.

D. Provide functional testing of Interior Lighting, Exterior Lighting, Lighting Control Devices, and Network Lighting Controls including all labor, equipment, materials, supplies and components, and perform all operations per **IECC 2012, C408.3.1 Functional testing.** Testing shall ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer’s installation instructions. The Electrical Contractor shall be responsible for including all functional testing in the bid. An approved third party independent contractor from the design or construction of the project shall be responsible for the functional testing and shall provide documentation to the Engineer certifying that the installed lighting controls meet the provisions of Section C405.

1. Where occupant sensors, time switches, programmable schedule controls, photo-sensors or daylighting controls are installed, the following procedures shall be performed:
    a. Confirm that the placement, sensitivity and time-out adjustments for occupant sensors yield acceptable performance.
    b. Confirm that the time switches and programmable schedule controls are programmed to turn the lights off.
    c. Confirm that the placement and sensitivity adjustments for photosensor controls reduce electric light based on the amount of usable daylight in the space as specified.

1.2 RELATED DOCUMENTS

A. General Provisions of Contract, General and Special Conditions, and General Requirements, apply to this Section.

1.3 QUALITY ASSURANCE

A. Minimum standards for all electrical work shall be latest revision of National Electrical Code (NEC). Whenever and wherever OSHA, NFPA, State Building Codes, Federal and State laws, regulations and design require higher standards than the NEC, these laws, regulations, and designs shall be followed.

B. Electrical inspection on all construction projects is required. The Electrical Inspection for this Project shall be provided by a STATE Electrical Inspector from the Kentucky State Fire Marshall's Office and may be ordered by calling (502) 564-3626. The Contractor shall provide and coordinate all Electrical Inspections as required by the STATE Electrical Inspector. Notify this STATE Electrical Inspector in writing immediately upon start of work and provide a copy of start work notice to the Architect/Engineer. The Contractor shall pay for all required inspections.

1. Provide all necessary inspections including both rough and finish work. Submit copies of all interim inspection reports to the Architect/Engineer as they occur.

2. Prior to final acceptance of work and release of final payment, submit to the Architect/Engineer the certificate of final inspection.

3. Approval from the STATE Electrical Inspector will not be allowed as reason for deviation from Contract Documents.

C. Obtain all permits required for entire construction of electrical system from authorities governing such work.

D. All materials shall be new and best of their respective kinds unless otherwise specified and shall be listed by UL and shall be so labeled. All equipment shall conform to latest approved standards of I.E.E.E., N.E.M.A., A.N.S.I., U.L. and O.S.H.A. See individual specification sections for other specific requirements.

E. Performance of work shall be in strict accordance with the best common practices in a thorough, substantial, neat and workman-like manner by competent, qualified workmen.

1.4 CONTRACT DOCUMENTS

A. Contract Documents are intended to cover furnishing and installing of complete electrical systems including miscellaneous systems, all tested and ready for operation.

B. Drawings

1. Drawings are schematic and show approximate locations of devices and equipment. Coordinate and field verify exact locations with other trades. Obtain A/E approval for significant deviations from drawing locations and layout.

2. The A/E reserves the right to make minor changes in the locations of electrical work or equipment prior to roughing-in without additional cost.

3. Examine the Contract Documents and immediately report any error, discrepancy or omission. The A/E will determine which interpretation shall take precedence where two or more conflicting statements occur. Otherwise, the Contractor is responsible for the more stringent interpretation. In general, schedules where they appear supersede specifications and specifications supersede plans.

4. Contract Documents are complementary, each to the other, and work required by either shall be included in the contract as if called for by both. Contractor shall make use of all data in the Contract Documents and shall verify this information at the building site. All Drawings on the Contract set are hereby made a part of these Specifications and shall be consulted by the Contractor and his work adjusted to meet the conditions shown thereon.

C. Drawings other than electrical drawings, and other sections of this specification, may show or specify electrically operated equipment and wiring diagrams. Examine all such drawings and specifications. Determine characteristics and provide necessary wiring and connections for all such equipment.

D. Keep electrical record drawings up to date each day. Record drawings will be reviewed by Architect/Engineer each month with Contractor's pay request submission.

1.5 SUBMITTALS

A. Refer to the Division 1 sections for general requirements concerning work-related submittals. For electrical work, the following minimum quantities are required for each category of submittal, unless greater quantity indicated in Division 1 requirements or individual work sections (quantity does not include copies required by governing authorities, or by Contractor for its own purpose.)

(1) Shop Drawings: 6 sets, including 3 for maintenance manuals.
(2) Product Data: 6 sets, including 3 sets for maintenance manuals.
(3) Samples: 3 sets of final submission.
(4) Certifications: 3 copies.
(5) Test Reports: 3 copies.
(6) Warranties (Guarantees): 6 copies, including 3 for maintenance manuals.
(7) Maintenance Manuals: 3 final copies, including wiring diagrams, maintenance and operating instructions, parts listings, and copies of other submittals indicated for inclusion.

B. Each submittal shall have Architect's/Engineer's Project Number, Specification Section Number, Schedule, Material and Data Submitted, indicated on its cover sheet. Each submittal sheet shall be marked so Architect/Engineer may readily determine particular item Contractor proposes to furnish.

1.6 OPERATING AND MAINTENANCE MANUALS

A. Submit to Architect/Engineer prior to substantial completion (6) copies of complete operating and maintenance instructions for equipment provided under this Contract. Provide complete parts lists for all new major equipment items. Refer to Special Conditions for additional requirements concerning maintenance manuals.

B. Organize each maintenance manual with index and thumb-tab marker for each section of information; bind in 2", 3-ring, vinyl-covered binder(s) with pockets to contain folded sheets, properly labeled on spine and face of binder(s) with the following:

Electrical System Operation and Maintenance Data

C. Index of contents shall include subcontract equipment vendor's names and addresses.

D. Include Brochures, data, parts lists, warranties, wiring diagrams, and manufacturer's operating and maintenance instructions. Final approved shop drawings shall be bound separately and submitted with other operating and maintenance information.

1.7 WARRANTY

A. Contractor shall be responsible for warranting all work, including equipment, materials, and workmanship provided under this section. Unless indicated otherwise under specific specification sections, this warranty shall be against all defects of the above and shall run a minimum period of one (1) year from date of substantial completion.

B. Defective work, equipment, materials and workmanship that develops within warranty period, which is not caused by ordinary wear, damage or abuse by others, shall be replaced or corrected without additional cost to Owner.

1.8 ALTERATIONS AND REMODELING

A. In alteration, extension and remodeling projects, existing conduits shall be extended, altered, or reconnected as indicated. Where existing conduits which are indicated to be revised, or which will be essential to the functioning of particular system, are cut or exposed due to construction changes, new connections shall be made in the most expeditious manner as directed or indicated. Where wiring is involved, new wires shall be "pulled in" between nearest available, accessible, reused outlets. In all cases where new wires are required, indicated or specified to be installed in existing conduits, if same cannot be installed, new conduits shall be provided as directed. Connect all new conduit, wiring, and apparatus to existing systems to function as complete units.

B. All conduits and electrical apparatus, in place and not indicated or specified to be re-used or which will not be essential to the functioning of various systems when work is complete, shall be removed and stored where directed. No old material shall be reinstalled or reused unless otherwise indicated on drawings or specified. Concealed conduits which are not indicated or specified to be reused and become

exposed due to construction changes shall be removed to nearest available, accessible, reused outlets.

C. Carefully lay out in advance, and where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work, this work shall be carefully done by dry core drilling and sawing. Damage to building, piping, or equipment shall be repaired by skilled mechanics of trades involved at no additional cost to Owner.

D. Electrical and communication service downtime shall be kept to a minimum. Any necessary utility outages shall be scheduled with the Owner a minimum of two weeks in advance. Scheduled outages must occur during times in which the building(s) are normally unoccupied.

E. Unless indicated otherwise, all electrical equipment, etc. which is to be removed and not reinstalled as part of this project, shall become the property of the Contractor. It shall be the responsibility of the Contractor to properly handle and dispose of these items.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Arrange deliveries of products in accordance with construction schedules to avoid conflict with work and site conditions.

1. Deliver products in undamaged condition, in manufacturer's original packaging with identifying labels intact and legible.

2. Immediately on delivery, inspect shipments to assure compliance with the requirements of the Contract Documents and approved submittals and that products are properly protected and undamaged.

B. Store products in accordance with manufacturer’s instructions with seals and labels intact. Store and protect materials and equipment delivered to site in such a manner as to effectively prevent damage from climatic conditions, condensation, dust, and physical abuse.

1. Store fabricated products above ground on blocking.

2. Arrange storage in a manner to provide access for inspection. Make periodic inspections of stored materials to assure that products are maintained free from damage and deterioration

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS, STANDARD PRODUCTS AND SUBSTITUTIONS

A. All material and equipment shall be new and in good condition. Refer to Division 1 for additional requirements.

B. Design is based upon a specific make and model of equipment. Naming of a certain brand or make or manufacturer in the specifications is to establish style or quality standard for articles desired. However, except where noted, the specifications are not intended to limit competition or the Contractor's option to use alternate products of equivalent concept, quality, and performance.

C. Products of alternate manufacturers listed may be substituted without approval prior to the Bid, if they are regularly catalogued items and meet the criteria of equivalence in concept, quality, and performance in the opinion of the Engineer. It is recommended that the opinion of the Engineer be solicited prior to the bid if there are any questions. This opinion does not guarantee approval of the submittals at a later time. In the case where the equipment is unfamiliar to the Engineer, all vendors desiring to furnish equipment other than that specified must submit, in addition to ordinary shop drawings, a complete verification specification for the substituted equipment along with catalogs, literature, wiring diagrams, piping diagrams, and a list of similar sized installations where the proposed equipment is installed. This information may be required to be presented immediately after the Bid and lack of information or of qualifications, as judged by the Engineer, may result in a Bid not being accepted.

D. All products which require submittals, whether design basis or otherwise accepted, must be formally approved by the Engineer before shipment to the job.

E. All materials and equipment shall be manufactured in the United States or by U.S. owned and operated companies unless otherwise indicated. Specific permission must be obtained from the Engineer for any deviation from this policy.

F. The Contractor is responsible for any and all costs for changes to the electrical work or the work of other trades necessitated by the optional substitution of approved alternate equipment. Approval of alternate equipment or modifications to the plans by the Engineer are not to be construed as relief from this responsibility. In the case of significant modification to the design, the Contractor may also be required to pay for the cost of design review and/or redesign by the Engineer.

G. Listing: The successful bidder shall furnish to the Engineer within one hour of the Bid opening, or as indicated in bidding instructions, a list of all major items of electrical equipment to be provided, indicating the manufacturer and the general type. Any list of required items included in the Bid Form, Instructions to Bidders or other Bid documents shall supersede these items. Changing manufacturers or subcontractors after the listing will not be acceptable, unless initiated by the Owner or the Engineer. Final acceptance of the bids is contingent upon submission and approval of these lists.

2.2 QUANTITIES AND COMPLETENESS

A. Items may be referred to as singular or plural on drawings and specifications. Contractor is responsible for determining quantity of each item.

B. All components required for the complete installation and legal, proper and safe operation of equipment and systems indicated in the Documents shall be provided by the Contractor. Optional accessory items shall be included only as specified.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES

A. Refer to Division 1 sections for general requirements for temporary facilities.

B. All such equipment shall be removed when permanent connections have been completed. Where it is determined, during construction, that temporary facilities, as installed, interfere with construction operations, relocate said facilities in an approved manner at no cost to Owner. Temporary connections shall be in accordance with NEC and OSHA requirements, Repair damage or injury to equipment, materials, or personnel caused by improperly protected temporary installations. All costs for materials and installation for temporary electrical facilities and energy for their operation shall be as specified in Division 1.

3.2 COORDINATION

A. Coordinate work of different trades so that:

B. All electrical materials and equipment shall be kept close as possible to ceiling, walls and columns, to take up a minimum amount of space.

C. Provide all offsets, fittings and similar items necessary in order to accomplish requirements of coordination without additional expense to Owner.

D. Drawings are diagrammatic and indicate general location of material and equipment. Refer to architectural and structural drawings and specifications for general construction of building, for floors and ceiling heights and for locations of walls, partitions, beams, and equipment, and be guided accordingly for setting of all equipment. Do not scale electrical drawings to determine exact locations.

E. Be responsible for locating all openings required in walls, floors, ceilings or roof for all materials and equipment provided under Electrical sections as well as providing manufacturer’s standard fire-stopping sealant for openings to equal fire resistance rating of the fire rated wall, floor, ceiling or partition.

1. Check with other trades on scope of their work and coordinate on all locations of various items of equipment and outlets before they are finally placed and connected. Relocation of material or equipment necessitated by failure to coordinate work shall be at no cost to Owner.

2. Do not cut work of any other trade without first consulting Architect's representative. Repair work damages by employing services of trade whose work is damaged. Where openings or sleeves have been omitted, they shall be drilled or sawed as directed by Architect/Engineer. All cutting and patching shall be the responsibility of this Section.

3. Wherever slots, sleeves or other openings are provided in floors or walls, for the passage of conduits or other forms of raceway, such openings, if unused, or spaces left in such openings after installation of conduit or raceway shall be filled. Filling materials for openings in walls and floors generally shall be fire-resistive and constructed and installed so as to prevent passage of water, smoke and fumes. Where conduits passing through openings are exposed in finished rooms, finishes of filling materials shall match and be flush with adjoining floor, ceiling or wall finishes.

4. Provide exposed conduit passing through floors, walls, or ceilings of finished rooms with chrome plated escutcheons. Plates shall be split, hinged type of sufficient outside diameter to amply cover up sleeve openings for pipe. Manufacturer's offering products complying with requirements include:

   Beaton and Caldwell, No. 10 or Approved Equal

5. Where conduits, and other electrical raceways pass through fire protections, fire walls, smoke partitions or floors, install a firestop to prevent the spread of fire, smoke and gases. Firestop material shall be packed tight and completely fill clearance between raceways and openings. Conduit sleeves for cable passage require a non-hardening, permanently pliable firestop system capable of being removed and reinstalled to permit the addition of cables. All firestop systems shall be U.L. listed for the application and installed in accordance with manufacturer's recommendations.

3.3 CLEANING

A. At completion of work required under this Contract and just prior to acceptance by Owner, thoroughly clean all exposed equipment fittings, fixtures, lenses and accessories and repair any damaged surfaces.

B. All electrical equipment shall be free of shipping tags, stickers, etc. Light fixture diffusers shall be clean and equipment enclosures shall be free of dust and debris. All painted equipment shall be free of scratches, blemishes and splattered paint.

3.4 SUPPORT OF ELECTRICAL ITEMS

A. Unless otherwise indicated, all electrical items or their supporting hardware, including but not limited to, conduits, raceways, cable trays, busways, cabinets, panelboards, wall-mounted transformers, boxes, and disconnect switches, shall be securely fastened to the building structure with the following methods. Fastening shall be by wood screws or screw-type nails on wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded studs driven in by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts or machine or wood screws. Threaded C-clamps with retainers may be used on rigid and intermediate steel conduit only. Conduits or pipe straps shall not be welded to steel structures. In partitions of light steel construction, sheet metal screws shall be used.

B. The load applied to any fastener shall not exceed one-fifth of the proof test load. Fasteners attached to concrete ceilings shall be vibration and shock-resistant.

3.5 TESTING AND BALANCING

A. Feeders and branch circuits shall have their insulation tested after installation, and before connection to fixtures and appliances. Perform with a 500-volt megger. Conductors shall test free from short-circuits and grounds. Test conductors phase-to-phase and phase-to-ground. Test readings shall be recorded and delivered to Architect/Engineer.

C. Circuit numbers indicated on the Drawings and panel schedules shall be adhered to. Any deviations shall be approved by the Architect/Engineer before installation.

D. Other tests to verify proper installation and operation shall include:

(a) Proper operation of fixtures and equipment
(b) Continuity of conduit systems

3.6 DEMONSTRATION

A. Provide to Owner a demonstration of installed systems. Coordinate demonstration with parties involved. Owner's representative may include persons who will be regularly providing maintenance, Architect, and Engineer.

B. Contractor shall have previously operated equipment and corrected deficiencies prior to arranging demonstration. Contractor shall have made himself familiar with system's proper operations, so demonstration shall proceed without wasting time of Owner's representatives.

3.7 TRAINING

A. Manufacturers supplying equipment for this division shall provide training in the operation and maintenance of equipment furnished to the owner's personnel.

Training shall take place at the project site after the equipment is fully operational. Refer to individual sections for specific training requirements.

END OF SECTION 260000

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 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. Related Sections include the following:

1. Division 27 Section "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.2 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

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.

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. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN and SO.

D. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC and Type SO with ground wire.

2.2 CONNECTORS AND SPLICES

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. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway; Metal-clad cable, Type MC.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway; Metal-clad cable, Type MC.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

I. Class 1 Control Circuits: Type THHN-THWN, in raceway.

J. Class 2 Control Circuits: Power-limited cable, concealed in building finishes.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

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. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 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 unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

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 and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Grounding systems and equipment.

1.3 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.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Bare Grounding Conductor and Conductor Protector for Wood Poles:

1. No. 4 AWG minimum, soft-drawn copper.
2. Conductor Protector: Half-round PVC or wood molding; if wood, use pressure-treated fir, cypress, or cedar.

D. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 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.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 5/8 by 96 inches (16 by 2400 mm) in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install barecopper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.

C. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) 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 to specified height above floor; connect to horizontal bus.

D. 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.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. 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.

C. 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.

D. 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 No. 4 AWG 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-12-inch (6.3-by-100-by-300-mm) grounding bus.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

E. Metal and Wood Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 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. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) 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.

D. 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.

E. 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.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

H. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet (6 m) 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.

3.4 LABELING

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

A. 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, 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 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. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 5000 kVA and Less: 5 ohms.
2. Power and Lighting Equipment or System with Capacity More Than 5000 kVA: 3 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

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 and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

B. Related Sections include the following:

1. Division 26 Section "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal 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 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.6 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Tyco International, Ltd.
      g. Wesanco, Inc.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   5. 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-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated 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.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slottedsupport system, sized 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 single-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. 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).

C. Mounting and Anchorage of Surface-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 Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted 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 substrate by means that meet seismic-restraint strength and anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 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.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 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.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

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. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Boxes, enclosures, and cabinets.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of 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. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. EMT: Comply with ANSI C80.3 and UL 797.

F. FMC: Comply with UL 1; zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

    a. Material: Steel.
    b. Type: Set screw or compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

I. Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, 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. Anamet Electrical, Inc.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.
6. Condux International, Inc.
7. Electri-Flex Company.
8. Kraloy.
9. Lamson & Sessions; Carlon Electrical Products.
10. Niedax-Kleinhuis USA, Inc.

11. RACO; a Hubbell company.
12. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic 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. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

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, suitable for environment where installed, 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. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

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. EGS/Appleton Electric.
2. Erickson Electrical Equipment Company.
3. Hoffman; a Pentair company.
4. Hubbell Incorporated; Killark Division.
5. Kraloy.
6. Milbank Manufacturing Co.

7. O-Z/Gedney; a brand of EGS Electrical Group.
8. RACO; a Hubbell Company.
9. Robroy Industries.
10. Thomas & Betts Corporation.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

G. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb (32 kg).

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.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep) with plaster ring.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: RNC, Type EPC-40-PVC.
2. Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:

    a. Loading dock.
    b. Mechanical rooms.
    c. Gymnasiums (exposed below 10').

3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: GRC.
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 nonmetallic in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (24-mm) trade size.

D. 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 setscrew or 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.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

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. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. A. Support conduit within 12 inches (300 mm) of enclosures to which attached.

I. Raceways shall not be embedded in slabs:
   1. Change from RNC, Type EPC-40-PVC to GRC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:

   1. Use EMT, IMC, or RMC for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Expansion-Joint Fittings:

1. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
2. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
3. 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.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit forequipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Division 31 Section "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. Underground Warning Tape: Comply with requirements in Division 26 Section "Identification for Electrical Systems."

3.4 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Division 26 Section "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.5 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.6 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 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

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. 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 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

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 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Tape:

   1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
   2. Printing on tape shall be permanent and shall not be damaged by burial operations.
   3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
3. Inscriptions for Orange-Colored Tapes: , COMMUNICATIONS CABLE.

2.4 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 (6.4-mm) grommets in corners for mounting.
3. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 10 by 14 inches (250 by 360 mm).

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 (915 MM)."

2.5 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with white letters on black 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 (10 mm).

2.6 EQUIPMENT IDENTIFICATION LABELS

A. 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).

2.7 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black except where used for color-coding.

2.8 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. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

G. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trenchexceeds 16 inches (400 mm) overall.

H. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

B. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

C. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

D. 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.

E. 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.

F. 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.

G. 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.

1. Labeling Instructions:

   a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
   c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   d. 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.

2. Equipment to Be Labeled:

   a. Panelboards: Type written directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Enclosed switches.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

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. Time switches.
2. Photoelectric switches.
3. Indoor occupancy sensors.
4. Lighting contactors.

B. Related Requirements:

1. Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.
2. Division 26 Section “Network Lighting Controls”

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.
2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Hubbell Building Automation, Inc.
   2. Lightolier Controls.
   3. Lithonia Lighting; Acuity Lighting Group, Inc.
   4. Sensor Switch, Inc.
   5. Watt Stopper.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
   3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
   4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
   5. Mounting:

      a. Sensor: Suitable for mounting in any position on a standard outlet box.
      b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
      c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

   6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
   7. Bypass Switch: Override the "on" function in case of sensor failure.
   8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux); turn lights off when selected lighting level is present.

C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

   1. Sensitivity Adjustment: Separate for each sensing technology.
   2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving

not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

2.2 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Hubbell Building Automation, Inc.
   2. Leviton Mfg. Company Inc.
   3. Lightolier Controls.
   4. Lithonia Lighting; Acuity Lighting Group, Inc.
   5. Sensor Switch, Inc.
   6. Watt Stopper.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
   3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor Tag WS1:

   1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft. (84 sq. m).
   2. Sensing Technology: Dual technology - PIR and ultrasonic.
   3. Switch Type: Single or Double pole as indicated, field selectable automatic "on," or manual "on" automatic "off."
   4. Voltage: 120 V; dual-technology type.
   5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
   6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
   7. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.3 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller thanNo. 14 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Lighting control devices will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.

3.7 DEMONSTRATION

A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control systems specified in Division 26 Section "Network Lighting Controls."

B. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 262416 - PANELBOARDS

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. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. TVSS: Transient voltage surge suppressor.

C. SPD: Surge Protection Device equal to TVSS.

D. GFCI: Ground Fault Circuit Interrupter.

E. AFCI: Arc Fault Circuit Interrupter.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage 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.

1.6 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

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.

C. Panelboard Schedules: For installation in panelboards.

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 Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

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. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.10 PROJECT CONDITIONS

A. Environmental Limitations:

1. 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.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 23 deg F (minus 5 deg C) to plus 104 deg F (plus 40 deg C).
    b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.11 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 in Division 03.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage 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. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

B. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.
c. Kitchen Areas: NEMA 250, Type 4X, stainless steel.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Finishes:

a. Panels and Trim: Steel and 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.
b. Back Boxes: Galvanized steel.

4. Directory Card: Inside panelboard door, mounted in transparent card holder.

C. Phase, Neutral, and Ground Buses:

1. Material: Tin-plated copper.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.

2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

D. 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. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with series-connected rating interrupting capacity to meet available fault currents.

1. 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.
2. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
3. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
4. 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 55 percent of rated voltage.
    f. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
    g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
    h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.5 PANELBOARD SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Current Technology; a subsidiary of Danahar Corporation.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Liebert Corporation.
5. Siemens Energy & Automation, Inc.
6. Square D; a brand of Schneider Electric.

B. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, solid-state, parallel-connected, non-modular type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:

1. Accessories:

    a. LED indicator lights for power and protection status.
    b. Audible alarm, with silencing switch, to indicate when protection has failed.
    c. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status.

C. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, , solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:

1. Accessories:
    a. Fabrication using bolted compression lugs for internal wiring.
    b. Integral disconnect switch.
    c. Redundant suppression circuits.
    d. Redundant replaceable modules.
    e. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
    f. LED indicator lights for power and protection status.
    g. Audible alarm, with silencing switch, to indicate when protection has failed.
    h. 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.
    i. Four-digit, transient-event counter set to totalize transient surges.
2. Peak Single-Impulse Surge Current Rating: 120 kA per mode/240 kA per phase.
3. Minimum single-impulse current ratings, using 8-by-20-mic.sec. waveform described in IEEE C62.41.2.

    a. Line to Neutral: 70,000 A.
    b. Line to Ground: 70,000 A.
    c. Neutral to Ground: 50,000 A.

4. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20-mic.sec. surges with less than 5 percent change in clamping voltage.
5. Protection modes and UL 1449 SVR for grounded wye circuits with 208Y/120-V, three-phase, four-wire circuits shall be as follows:

    a. Line to Neutral: 400 V for 208Y/120.
    b. Line to Ground: 400 V for 208Y/120.
    c. Neutral to Ground: 400 V for 208Y/120.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

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 NEMA PB 1.1.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

C. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

D. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

E. 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.

F. Install overcurrent protective devices and controllers not already factory installed.

    1. Set field-adjustable, circuit-breaker trip ranges.

G. Install filler plates in unused spaces.

H. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

I. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

J. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

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.

3.5 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 indicated

END OF SECTION 262416

SECTION 262713 - ELECTRICITY METERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes equipment for electricity metering by utility company.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Dimensioned plans and sections or elevation layouts and wiring diagrams.

C. Field quality-control reports.

1.3 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.

PART 2 - PRODUCTS

2.1 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY

A. Meters will be furnished by utility company.

B. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.

C. Meter Sockets: Comply with requirements of electrical-power utility company.

D. Meter Sockets: Steady-state and short-circuit current ratings shall meet indicated circuit ratings.

E. Modular Meter Center: Factory-coordinated assembly of a main service terminal box with lugs only, wireways, tenant meter socket modules, and tenant feeder circuit breakers arranged in adjacent vertical sections. Assembly shall be complete with interconnecting buses and other features as specified below.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
c. Siemens Energy & Automation, Inc.
d. Square D; a brand of Schneider Electric.
e. Or approved equal.

2. Comply with requirements of utility company for meter center.
3. Housing: NEMA 250, Type 3R enclosure.
4. Main Circuit Breaker: as indicated on drawings.
5. Bus: Copper
6. Minimum Short-Circuit Rating: 42,000 A symmetrical at rated voltage, confirm this rating with local utility company and increase as necessary.
7. Tenant Feeder Circuit Breakers: Series-combination-rated molded-case units, rated to protect circuit breakers in downstream tenant and to house loadcenters and panelboards that have 10,000-A interrupting capacity.
   a. Identification: Complying with requirements in Division 26 Section "Identification for Electrical Systems" with legend identifying tenant's address.
   b. Physical Protection: Tamper resistant, with hasp for padlock.
8. Meter Socket: Rating coordinated with indicated tenant feeder circuit rating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with equipment installation requirements in NECA 1.

B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.

C. Install modular meter center according to NECA 400 switchboard installation requirements.

D. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
   1. Series Combination Warning Label: Self-adhesive type, with text as required by NFPA 70.

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. Turn off circuits supplied by metered feeder and secure them in off condition.

C. Prepare test and inspection reports.

END OF SECTION 262713

SECTION 262726 - WIRING DEVICES

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. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Tamper-resistant receptacles.
4. Weather-resistant receptacles.
5. Snap switches and wall-box dimmers.
6. Solid-state fan speed controls.
7. Wall-switch and exterior occupancy sensors.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

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. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

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. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 5351 (single), CR5362 (duplex).
b. Hubbell; HBL5351 (single), HBL5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).

d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; VGF20.
b. Hubbell; GFR5352L.
c. Pass & Seymour; 2095.
d. Leviton; 7590.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Single Pole:

1) Cooper; AH1221.
2) Hubbell; HBL1221.
3) Leviton; 1221-2.
4) Pass & Seymour; CSB20AC1.

b. Three Way:

1) Cooper; AH1223.
2) Hubbell; HBL1223.
3) Leviton; 1223-2.
4) Pass & Seymour; CSB20AC3.

c. Four Way:

1) Cooper; AH1224.
2) Hubbell; HBL1224.
3) Leviton; 1224-2.

4) Pass & Seymour; CSB20AC4.

C. Key-Operated Switches, 120/277 V, 20 A:

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. Cooper; AH1221L.
b. Hubbell; HBL1221L.
c. Leviton; 1221-2L.
d. Pass & Seymour; PS20AC1-L.

2. Description: Single pole, with factory-supplied key in lieu of switch handle.

D. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 1995.
b. Hubbell; HBL1557.
c. Leviton; 1257.
d. Pass & Seymour; 1251.

E. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

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. Cooper; 1995L.
b. Hubbell; HBL1557L.
c. Leviton; 1257L.
d. Pass & Seymour; 1251L.

2.6 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.7 FINISHES

A. Device Color: Color selected by Architect.

1. Wiring Devices Connected to Normal Power System: unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: Color selected by Architect

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. 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.

C. 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.

D. 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. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. 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.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
3. Using the test plug, verify that the device and its outlet box are securely mounted.
4. 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.

C. Wiring device will be considered defective if it does not pass tests and inspections.

END OF SECTION 262726

SECTION 262813 - FUSES

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. Cartridge fuses rated 600-V ac and less for use in control circuits enclosed switches.

1.3 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, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

1.4 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.5 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

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. Edison Fuse, Inc.
3. Ferraz Shawmut, Inc.
4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:
1. Motor Branch Circuits: Class RK5, time delay.
2. Other Branch Circuits: Class RK5, time delay.
3. Control Circuits: Class CC, fast acting.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

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 and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

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, accessories, 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. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

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. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

1.7 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. 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.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. 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 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 Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers 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. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. 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 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, 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.

3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816

SECTION 264300 - SURGE SUPPRESSION DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surge Suppression Devices (SPD).

1.2 RELATED SECTIONS

A. Section 262416 - Panelboards.

C. Section 283111 - Fire Alarm Systems.

1.3 REFERENCES

A. ANSI/IEEE C84.1-1989, American National Standard for Electric Power Systems and Equipment - Voltage Ratings (60 Hertz).

B. ANSI/IEEE C62.41-1991, Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

C. ANSI/IEEE C62.45-1992, IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.

D. Underwriters Laboratories UL 1449 Standard for Safety - Transient Voltage Surge Suppressors, Revised edition July 2, 1987.

E. Underwriters Laboratories, UL 1283, Standard for Safety - Electromagnetic Interference Filters, August 23, 1993.

F. National Fire Protection Association, National Electrical Code 1993.

G. IEEE Standard 142-1991, IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems (IEEE Green Book).

H. ANSI/IEEE Standard 141-1986, IEEE Recommended Practice for Electric Power Distribution for Industrial Plants (IEEE Red Book).

I. IEEE Standard 1100-1992, IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment (IEEE Emerald Book).

J. FIPS Pub 94, Federal Information Processing Standards Publication - Guideline on Electrical Power for ADP Installations.

K. MIL Standard 220A Method of Insertion-loss Measurement.

1.4 REQUIRED SUBMITTALS

A. Submit manufacturer's data on TVSS products and enclosures. Project Data: Include rated capacities; shipping, installed and operating weights; furnished specialties; and accessories for each model indicated.

B. UL-1449, 2nd Edition SVR: Provide UL-1449, 2nd Edition reports verifying the Suppressed Voltage Ratings (SVRs).

C. Single Pulse Surge Current Capacity: Provide 3rd party test data verifying that testing has been performed on a COMPLETE device, including all necessary fusing, disconnects, thermal disconnects, etc.

D. Minimum Repetitive Surge Current Capacity: Provide 3rd party test data verifying that testing has been performed on a COMPLETE device, including all necessary fusing, disconnects, thermal disconnects, etc.

E. Short Circuit Current Rating (AIC): Provide 3rd party test data verifying that testing has been performed on a COMPLETE device.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

B. Maintain one copy of document on site.

C. Each complete suppression unit shall be Underwriters Laboratories, Inc. approved.

D. Each complete suppression unit shall be UL 1449 listed and shall bear the suppressed voltage rating issued by UL for all protected modes.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years experience, certified as compliant with ISO 9001:1994, and accredited by the UK National Accreditation Council for Certification Bodies. Provide a copy of the ISO 9001:1994 Certificate of Registration to Architect/Engineer.

B. Supplier: Franchised distributor of specified manufacturer with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.8 WARRANTY

A. Manufacturer shall provide a product warranty for a period of not less than five (5) years for switchboards, panelboards, and individual equipment TVSS units. Manufacturer shall provide a product warranty for a period of not less than five (5) years for telecommunication and data TVSS units.

B. The first five (5) years of this warranty will include the labor to field replace modules or the labor required to remove, repair and reinstall the TVSS device.

PART 2 PRODUCTS

2.1 TVSS - SERVICE ENTRANCE

A. Manufacturers

1. Liebert Interceptor
2. Square D
3. Siemens
4. General Electric

B. Circuit configuration of the suppresser shall be thermal stress reducing, custom parallel, and solid state. All suppression circuits shall be totally encapsulated by the manufacturer in a thermally conductive chemical compound. All materials used as a component or encapsulant shall be in conformance with The Federal Clean Air Act Amendments of 1990, Section 602 and 611, prohibiting the use of Class I or Class II ozone depleting chemicals.

C. Enclosure: steel, NEMA 4, weatherproof.

D. Protection modes: Dedicated, Dedicated Line-to-neutral, Dedicated Line-to-ground, and Dedicated Neutral-to-ground.

E. Provide fusible or integral disconnect.

F. Response Time: Less than 1 nanosecond.

G. Provide LED indicators, one per phase to alert loss of protection.

H. Peak Surge Current: 150 kA per mode of protection.

2.2 TVSS - DISTRIBUTION SWITCHBOARDS

A. Circuit configuration of the suppresser shall be thermal stress reducing, custom parallel, and solid state. All suppression circuits shall be totally encapsulated

by the manufacturer in a thermally conductive chemical compound. All materials used as a component or encapsulant shall be in conformance with The Federal Clean Air Act Amendments of 1990, Section 602 and 611, prohibiting the use of Class I or Class II ozone depleting chemicals.

B. Enclosure: NEMA 4, weatherproof.

C. Protection modes: Line-to-line, Line-to-neutral, Line-to-ground, and Neutral-to-ground.

D. Provide fusible disconnect or breaker in panelboard for TVSS connection.

E. Response Time: Less than 1 nanosecond.

F. Provide LED indicators, one per phase to alert loss of protection.

G. Peak Surge Current: 80 kA per mode of protection.

2.3 TVSS - PANELBOARDS AND FIRE ALARM PANELS

A. Circuit configuration of the suppresser shall be thermal stress reducing, custom parallel, and solid state. All suppression circuits shall be totally encapsulated by the manufacturer in a thermally conductive chemical compound. All materials used as a component or encapsulant shall be in conformance with The Federal Clean Air Act Amendments of 1990, Section 602 and 611, prohibiting the use of Class I or Class II ozon depleting chemicals.

B. Enclosure: NEMA 4, weatherproof.

C. Protection modes: Line-to-line, Line-to-neutral, Line-to-ground, and Neutral-to-ground.

D. Sine Wave Tracking: Suppresser to have active sine wave tracking technology of the voltage waveform.

E. Provide fusible disconnect or breaker in panelboard for TVSS connection.

F. Response Time: Less than 1 nanosecond.

G. Provide LED indicators, one per phase to alert loss of protection.

H. Peak Surge Current: 80 kA per mode of protection.

PART 3 EXECUTION

3.1 INSTALLATION

A. Verify the proper application of the TVSS (i.e. voltage, phases, etc.) and coordinate with upstream and downstream transient suppression. Verify that all

Neutral conductors are bonded to the system Ground at the service entrance or the serving isolation transformer prior to installation of the associated TVSS.

B. Provide all labor, materials, equipment and services necessary for and incidental to the installation of the TVSS system components as specified herein. Only licensed electricians shall install TVSS units.

C. Provide the transient voltage surge suppressors as indicated in manufacturer's installation instructions and in accordance with the applicable portions of NEC and in accordance with recognized industry practices to ensure that product complies with requirements. NEC, State, and Local Codes will prevail.

D. Install in accordance with manufacturer’s instructions.

E. Connect TVSS leads with minimum conductor length and rounded-radius bends with no sharp turns.

END OF SECTION 264300

SECTION 265100 - INTERIOR LIGHTING

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 lighting fixtures, lamps, and power supplies.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. LED: Light Emitting Diode.

D. LER: Luminaire efficacy rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting fixture, including housing.

1.4 ACTION SUBMITTALS

A. 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. Energy-efficiency data.
4. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
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, drivers, power

supplies, and accessories identical to those indicated for the lighting fixture as applied in this Project.

a. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Installation instructions.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

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. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.8 WARRANTY

A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.

2. Warranty Period for Emergency LED Drivers, Inverters, and Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. LED Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

    a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
    b. UV stabilized.

2. Glass: Annealed crystal glass unless otherwise indicated.

G. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and LED driver characteristics:

    a. "USE ONLY" and include specific lamp type.

b. CCT and CRI for all luminaires.
c. Lumen output and lumen per watt.

2.3 DRIVERS FOR LED LAMPS

A. Comply with UL and include the following features, unless otherwise indicated:

1. Driver: LED programmable dimmable driver, located in fixture electrical housing.
2. Normal Ambient Operating Temperature: 104 deg F (40 deg C).
3. Fuses: One in each ungrounded power supply conductor. Voltage and current ratings as recommended by driver manufacturer.

2.4 LED LAMPS

A. Light emitting diode technology, a minimum CRI 70 , color temperature 4000 K, and 50,000 hour life with 0.85 lumen maintenance factor.

2.5 EMERGENCY POWER UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.

1. Emergency Connection: Operate LED lamp(s) continuously at an output of 700-1400 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture power supply.
2. Nightlight Connection: Operate LED lamp continuously.
3. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.

    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

4. Battery: Sealed, maintenance-free, nickel-cadmium type.
5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
6. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

B. External Type: Self-contained, modular, battery-inverter unit, suitable for powering LED lamps, remote mounted from lighting fixture. Comply with UL 924.

1. Emergency Connection: Operate LED continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture power supply and driver.
2. Battery: Sealed, maintenance-free.

3. Charger: Fully automatic, solid-state, constant-current type.
4. Housing: NEMA 250, Type 1 enclosure.
5. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
6. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.6 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
   1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
   2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

      a. Battery: Sealed, maintenance-free, nickel-cadmium type.
      b. Charger: Fully automatic, solid-state type with sealed transfer relay.
      c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
      d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
      e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
      f. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.7 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.

   1. Battery: Sealed, maintenance-free, lead-acid type.
   2. Charger: Fully automatic, solid-state type with sealed transfer relay.
   3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
   4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.8 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).

D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.

1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

4. Install at least two independent support rods or wires from structure to a tab on diagonal corners on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

D. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

E. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

F. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. 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 265100

SECTION 271005 – TELEPHONE SYSTEM

PART 1 GENERAL

1.01 SCOPE

A. Work under this section includes the furnishing and installation of raceway system and complete prewiring of the horizontal system including cables, conduits, boxes, blank plates, jacks and outlet plates as specified herein and as shown on the drawings.

1.02 RELATED SECTIONS

A. Section 260533 - Raceway and Boxes for Electrical Systems

B. Section 262726 – Wiring Devices

1.03 SUBMITTALS

A. Shop Drawings
   1. Submit shop drawings and product data in accordance with Division 1.
   2. Submit shop drawings for telephone, jacks and cables and labeling procedure.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Raceway and Boxes for Electrical Systems - Refer to Section 260533.

B. Jacks - Leviton, Systimax, or approved equal by Owner.

C. Cable – Mohawk, Superior Essex, Commscope, or approved equal by Engineer.

2.02 VOICE/DATA EQUIPMENT

A. Conduit
   1. Conduit shall be minimum 1" and as sized on drawings, type EMT where exposed or concealed in walls and ceilings. Conduits shall be concealed wherever possible. Conduits for individual voice/data outlets shall be installed to the nearest telecommunication board.

B. Outlet Boxes
   1. Outlet boxes shall be 4 inch square, 2-1/2 deep galvanized steel with 2 gang mud ring.

C. Jacks
   1. Voice/Data activated outlets shall be equipped with flush mounted 4 terminal jacks, assembly as required. All unactivated outlets shall be equipped with stainless steel blank plates to match specified wiring device plates.

2. Jacks shall be mounted in a 106-type frame, a mounting frame Leviton 41087 QP.
3. Jacks shall be Category 6, Leviton #5G110-R05 (orange), Systimax #108232703 (orange).
4. Coverplate shall be Type 302 stainless steel.
5. Provide (3) three Category 6 cables to each outlet unless noted otherwise on drawings.
6. Device color and plate shall match receptacles and switches.

D. Cables
1. Voice/data cables shall be Category 6, 24 gauge solid copper, unshielded, 4 twisted pair, (UTP) blue.
2. Mohawk #M56168B or Superior Essex #52-241-28 plenum rated.
3. Conductors shall be twisted to form pairs and fully color coded. Conductors twist shall be of varying lay lengths to eliminate crosstalk.
4. All conductors shall be continuous and splice free.
5. Cables shall be U.L. listed, comply with Article 800 of the NEC, and meet the requirements of UL 444 and ICEA. Cables shall meet the physical and electrical requirements of 100 OHM “Backbone Cable” as defined by EIA/TIA-568 standard for commercial building wire.

E. Voice/Data Jack Identification
1. Each jack shall be labeled. The labeling follows a standard format, indicating the room followed by the location within the room as follows:

<u>AA-BBB-CC</u>

A - 2 characters
B - 5 characters
C - 2 characters

‘A’ characters are the floor the outlet is on.

- Example: ‘01”= First, “02”= Second, etc

‘B’ characters are the room identifier. These characters indicate the room number that the jack is located within. These should always be characters in length. O’s shall be used as fillers. Coordinate with Owner. See variations to room numbers below:

- OS – Outside of Room XXX, OSXXX.
- OC – Cubicle Area in Room XXX, OCXXX
- HL or OH – Hallway near Room XXX, HLXXX.

‘C’ characters are the specific jack identifier. These two characters specifically identify a jack within a room. The jack labeling scheme begins with AA, incrementing to AB, etc. giving each jack in the room its own identification.

2. Labels shall be self-adhesive type that is approved by Engineer. Labels shall be

typed printed and shall not be drawn by hand.

3. As-built drawings shall identify voice/data jack numbers for each outlet.

PART 3 EXECUTION

3.01 INSTALLATION

A. All cable shall be installed in conduit concealed in walls or concealed above non-accessible ceilings and in an approved raceway above accessible ceilings.

B. The installation shall follow the following standards:

1.	TIA/EIA-568-A	Commercial Building Telecommunications Cabling Standard
2.	TIA/EIA-568-A-1	Propagation Delay and Delay Skew Specs for 100Ω 4-pair Cable
3.	TIA/EIA-568	Category 6 standards
4.	TIA/EIA-569-B	Commercial Building Standard for Telecom. Pathways and Spaces
5.	TIA/EIA-TSB 72	Centralized Optical Fiber Cabling Guidelines
6.	TIA/EIA-TSB 75	Additional Horizontal Cabling Practices for Open Offices
7.	TIA/EIA-TSB 95	Additional Transmission Performance Guidelines for 4-pair 100Ω Category 5E Cable
	TIA/EIA-606	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
8.	TIA/EIA-607	Commercial Building Grounding/Bonding Requirements
9.	NFPA 70	National Electric Code (NEC) (esp. Art 800 and Art 770)
10.	ISO/IEC 11801	Generic Cabling for Customer Premises

The most recent versions of all documents apply to this project.
If there is a conflict between applicable documents, the order above shall dictate the order of precedence in resolving the issue unless an enforceable local or national code is in effect.

C. The voice/data system shall be completely prewired by the Electrical Contractor including individual outlet jack and plate assemblies. Phones and telephone distribution or switching equipment will be provided by the Owner.

D. Voice/data cables installed in air plenum ceiling spaces without conduit shall be special fire/smoke resistive type approved by the local inspection authority.

E. Provide all sleeves necessary for telephone system installation. All openings in firewalls and floors for telephone cables shall be filled by this contractor after cables are installed with fire-retardant material. Refer to Section 260533 - Article 3.01 - B.

F. All empty conduits furnished and installed by this Contractor for the voice/data system

shall have a pull wire in place.

G. All voice/data cables installed in underslab conduit shall be outdoor rated.

3.02 CABLE INSTALLATION

A. All cables, termination components and support hardware shall be furnished, tested, installed and wired by the Contractor.

B. During pulling operation an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.

C. Cable pulling shall be done in accordance with cable manufacturer's recommendations and ANSI/IEEE C2 standards. Recommended pulling tensions shall not be exceeded.

D. Manufacturers minimum bend radius specifications shall followed in handling, installation and securing of all cables. Any cable bent or kinked to radius less than recommended dimension shall not be installed.

E. All cables shall be installed splice-free.

F. Cable sheaths shall be protected from damage from sharp edges during and after installation. Where a cable passes over a sharp edge, a bushing or grommet shall be used to protect the cable.

G. All cable shall be free of tension at both ends. In cases where the cable must bear some stress, Kellom grips may be used to spread the strain over a longer length of cable.

H. Contractor is responsible for verifying cabling requirements prior to construction to insure that the installation is compliant with all code restrictions.

I. All openings made to accommodate the installation of any cable shall be sleeved and fire-stopped per prevailing code requirements upon completion of cable installation.

J. Installation of cables shall use a turning radius of 10 times the diameter of the cable.

K. Cable pulling shall be done in accordance with cable manufacturer’s recommendations and ANSI/IEEE C2 standards. Recommended pulling tensions shall not be exceeded.

L. Data termination hardware shall meet full Category 6 performance specifications as defined by TSB-40A specifications for connecting hardware.

3.03 CABLE TESTING

A. Test shall be conducted in accordance with TIA 568C.

B. Any cable that fails these tests shall be re-terminated and tested again. If the cable does not meet specifications after being re-terminated, replace cable, terminate, and test again.

C. The test results for each link shall be recorded in the memory of the field tester upon completion of the test.

D. The test results saved by the tester shall be transferred to a CD-ROM. A guarantee shall be provided that the results of the measurement shall be transferred to the CD-ROM unaltered – that is, as saved by the tester at the end of each test. The guarantee shall also specify that the results cannot be modified at a later date.

E. The test results for the completed project shall be stored and delivered to Owner on a CD-ROM, along with the software tools required to view, inspect, and print any section of the test reports.

END OF SECTION 271005

SECTION 311000 - SITE CLEARING

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. Stripping and stockpiling topsoil.
2. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Division One Section 01500 “Construction Facilities and Temporary Controls" for temporary erosion- and sedimentation-control measures.

1.3 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.

B. Topsoil stripping and stockpiling program.

C. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

D. Burning: Documentation of compliance with burning requirements and permitting of authorities having jurisdiction. Identify location(s) and conditions under which burning will be performed.

1.6 QUALITY ASSURANCE

A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.7 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing 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 trafficways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing 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. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises.

D. Utility Locator Service: Notify Call Before You Dig for area where Project is located.

E. Do not commence any site clearing operations until temporary erosion- and sedimentation-control measures are in place.

F. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000MB "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Once the site is stable in accordance with K.P.D.E.S. regulations, remove erosion and sedimentation controls and restore areas disturbed during removal.

3.3 EXISTING UTILITIES

A. Interrupting 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 Owner and Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.

B. Excavate for and remove underground utilities indicated to be removed.

3.4 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches. Do not stockpile topsoil within protection zones.
2. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.5 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 312000 - EARTH MOVING

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. Division 0 Document 003132A “Geotechnical Data” for copy of Geotechnical Report.

C. Division 1 Section 014150 “Special Inspection and Testing” for inspection and testing of soils subject to special inspection and testing by Special Inspection Agency.

1.2 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades.
3. Subbase course for concrete.
4. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
2. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
3. Section 312319 "Dewatering" for lowering and disposing of ground water during construction.
4. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices for earth moving.

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. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

F. Fill: Soil materials used to raise existing grades.

G. 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.

H. 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.

I. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

J. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct preexcavation conference at Project site.

1. Review methods and procedures related to earthmoving, including, but not limited to, the following:

    a. Personnel and equipment needed to make progress and avoid delays.
    b. Coordination of Work with utility locator service.
    c. Extent of trenching by hand or with air spade.
    d. Field quality control.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled low-strength material, including design mixture.

3. Warning tapes.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.

C. 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.

1.8 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.9 FIELD 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. Utility Locator Service: Notify Call Before you Dig for area where Project is located before beginning earth-moving operations.

C. Do not commence earth-moving operations until temporary and erosion and sedimentation control measures are in place.

1.10 GEOTECHNICAL INVESTIGATION

A. A geotechnical engineering study has been performed by ECS Southeast LLC< Louisville, Kentucky, and a copy is located in this Project Manual.

B. The Geotechnical Report is not a part of the Contract Documents. However, recommendations of the geotechnical study are hereby incorporated as minimum standards for this Project except as modified by the requirements of this project manual.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations. Contractor to provide borrow materials to meet proposed grades.

B. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

C. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

D. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

G. 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 sieve and zero to 5 percent passing a No. 4 sieve.

H. Sand: ASTM C 33/C 33M; fine aggregate.

I. 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. Survivability: As follows:

a. Grab Tensile Strength: 157 lbf; ASTM D 4632.
b. Sewn Seam Strength: 142 lbf; ASTM D 4632.
c. Tear Strength: 56 lbf; ASTM D 4533.
d. Puncture Strength: 56 lbf; ASTM D 4833.

3. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
4. Permittivity: 0.1 per second, minimum; ASTM D 4491.
5. 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/C 150M, Type I.
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33/C 33M, 3/4-inch (19-mm) nominal maximum aggregate size.
4. Foaming Agent: ASTM C 869/C 869M.
5. Water: ASTM C 94/C 94M.
6. Air-Entraining Admixture: ASTM C 260/C 260M.

2.4 ACCESSORIES

A. 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. Protect subgrades and foundation soils from freezing temperatures and frost. 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.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

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.

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 trenches 4 inches 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.

3.8 SUBGRADE INSPECTION

A. Notify Owner & Special Inspection Agency when excavations have reached required subgrade.

B. If Owner and/or Special Inspection Agency determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade with a pneumatic-tired tandem-axle dump truck weighing not less than 15 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 the Owner and/or Special Inspection Agency, and replace with compacted backfill or fill as directed.
3. Ensure Owner is present for all proof-rolling.

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 the Owner and/or Special Inspection Agency, 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 the Special Inspection Agency.

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, 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 of bottom of footings with crushed stone; fill with concrete to elevation of bottom of footings.

D. Backfill voids with satisfactory soil while removing shoring and bracing.

E. Initial Backfill:

1. Crushed Stone Backfill: Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of at least 6 inches over the pipe or conduit.

a. 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.

F. Final Backfill:

1. Final backfill in landscape areas can be select soil compacted to 95% standard proctor with no rock greater than 3/4 inch, no debris, and no organics.

2. Final backfill in paved areas shall be compacted crushed stone.

a. Crushed stone should be allowed to settle for 30 days prior to paving.

G. Warning Tape: Install detectable warning tape directly above utilities, 12 inches 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. 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.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

D. 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.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches 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.

3.15 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 elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1/2 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.16 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Section 334600 "Subdrainage."

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Place base course material over subbase course under hot-mix asphalt pavement.
2. Shape subbase course and base course to required crown elevations and cross-slope grades.
3. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
4. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
5. Compact subbase course and base course at 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 698.

3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. 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 or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.19 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 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.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove waste materials, unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 312319 - DEWATERING

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 construction dewatering.

B. Related Requirements:

1. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.
2. Section 334600 "Subdrainage" for permanent foundation wall, underfloor, and footing drainage.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Existing Conditions: Using photographs, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

C. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in dewatering work.

1.5 FIELD CONDITIONS

A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
2. Prevent surface water from entering excavations by grading, dikes, or other means.
3. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
4. Remove dewatering system when no longer required for construction.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

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 dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
3. Maintain piezometric water level a minimum of 24 inches (600 mm) below bottom of excavation.

C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches (900 mm) below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

B. Prepare reports of observations.

3.5 PROTECTION

A. Protect and maintain dewatering system during dewatering operations.

B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION

SECTION 313116 - TERMITE CONTROL

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. Soil treatment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include the EPA-Registered Label for termiticide products.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each type of termite control product.

C. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Termiticide brand name and manufacturer.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes used, and rates of application.
6. Areas of application.
7. Water source for application.

D. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.

1.6 FIELD CONDITIONS

A. Soil Treatment:

1. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
2. Related Work: Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.7 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain termite control products from single source.

2.2 SOIL TREATMENT

A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application and installation of termite control treatment(s). Remove extraneous sources of wood cellulose and other edible materials, such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, according to requirements of authorities having jurisdiction.

3.3 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.
3. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.

B. Post warning signs in areas of application.

C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.4 PROTECTION

A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

B. Protect termiticide solution dispersed in treated soils and fills from being diluted by exposure to water spillage or weather until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

END OF SECTION

SECTION 321313 - CONCRETE PAVING

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 the Following:

1. Walks.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for general building applications of concrete.
2. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to concrete paving, including but not limited to, the following:

a. Concrete mixture design.
b. Quality control of concrete materials and concrete paving construction practices.

2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:

a. Contractor's superintendent.

b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete paving Subcontractor.
e. Manufacturer's representative of stamped concrete paving system used for stamped detectable warnings.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.6 INFORMATIONAL SUBMITTALS

A. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

B. Material Test Reports: For each of the following:

1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

C. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.9 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

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 design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet (30.5 m) or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, fabricated from galvanized-steel wire into flat sheets.

B. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

C. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.

D. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

E. 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 paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

G. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

H. Zinc Repair Material: ASTM A 780/A 780M.

2.4 CONCRETE MATERIALS

A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150/C 150M, gray] portland cement Type I.
2. Fly Ash: ASTM C 618, Class C.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 1N, uniformly graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:

1. Aggregate Sizes: 3/4 to 1 inch (19 to 25 mm) nominal.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

F. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

G. Water: Potable and complying with ASTM C 94/C 94M.

2.5 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Water: Potable.

C. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

1. Available Products:
   a. Axim Concrete Technologies; Cimfilm.
   b. Burke by Edeco; BurkeFilm.
   c. Sika Corporation, Inc.; SikaFilm.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

E. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

2.6 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch (3 to 6 mm).

E. Pigmented Mineral Dry-Shake Hardener: Factory-packaged, dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.

2.7 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.

B. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 6 percent plus or minus 2 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete as required for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

E. Concrete Mixtures: Normal-weight concrete.

1. Compressive Strength (28 Days): 3500 psi.
2. Slump Limit: 3 inches, plus or minus 1 inch.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F (30 and 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.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete batches of 1 cu. yd. (0.76 cu. m) or smaller, 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.
2. For concrete batches 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, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).

3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides 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.

3.4 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Install welded-wire reinforcement 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.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges 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 paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.

2. Provide tie bars at sides of paving strips where indicated.
3. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
4. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch 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. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. 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, to match jointing of existing adjacent concrete paving:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 3/8-inch radius. Repeat grooving of contraction joints after applying surface finishes.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete driving surfaces.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, reinforcement, and items to be embedded or cast-in.

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 time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

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 according to ACI 301 (ACI 301M) by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

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 and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs: Use design mixture for placement. Produce curbs to required cross section, lines, grades, finish, and jointing.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and 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. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. 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 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.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture 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. Continuous water-fog spray.
    b. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or 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.

3.9 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 (ACI 117M) and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-feet-long; unleveled straightedge not to exceed 1/2 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch.
6. Vertical Alignment of Dowels: 1/4 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 3 inches.

9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Contractor to engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231/C 231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture 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 Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.11 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by the Owner and/or Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 321373 - CONCRETE PAVING 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. Cold-applied joint sealants.
2. Hot-applied joint sealants.
3. Cold-applied, fuel-resistant joint sealants.
4. Hot-applied, fuel-resistant joint sealants.
5. Joint-sealant backer materials.
6. Primers.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Paving-Joint-Sealant Schedule: Include the following information:
1. Joint-sealant manufacturer and product name.
2. Joint-sealant formulation.
3. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of joint sealant and accessory.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 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.
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 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. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type NS.

B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.

C. Multicomponent, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.

D. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

E. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade P, Class 25, for Use T.

2.3 HOT-APPLIED JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I.

B. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I or Type II.

C. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I, II, or III.

D. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type IV.

2.4 COLD-APPLIED, FUEL-RESISTANT JOINT SEALANTS

A. Fuel-Resistant, Single-Component, Pourable, Modified-Urethane, Elastomeric Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

B. Fuel-Resistant, Multicomponent, Pourable, Modified-Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade P, Class 12-1/2 or 25, for Use T.

2.5 HOT-APPLIED, FUEL-RESISTANT JOINT SEALANTS

A. Hot-Applied, Fuel-Resistant, Single-Component Joint Sealants: ASTM D 7116, Type I or Type II.

B. Hot-Applied, Fuel-Resistant, Single-Component Joint Sealants: ASTM D 7116, Type III.

2.6 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.7 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints 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: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

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. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backings to support joint 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 joint-sealant backings.
2. Do not stretch, twist, puncture, or tear joint-sealant backings.
3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact 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.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements 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 joint sealant from surfaces adjacent to joints.
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.

3.4 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

B. 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 and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.5 PAVING-JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Joints within concrete paving.

1. Joint Location:

a. Expansion and isolation joints in concrete paving.
b. Contraction joints in concrete paving.
c. Other joints as indicated.

2. Joint Sealant: Single-component, nonsag, silicone joint sealant, Single-component, self-leveling, silicone joint sealant, Multicomponent, nonsag, urethane, elastomeric joint sealant, Single component, pourable, urethane, elastomeric joint sealant, Multicomponent, pourable, urethane, elastomeric joint sealant, Hot-applied, single-component joint sealant.
3. Joint-Sealant Color: Manufacturer's standard to match adjacent pavement.

B. Joint-Sealant Application: Joints within concrete paving and between concrete and asphalt paving.

1. Joint Location:

a. Joints between concrete and asphalt paving.
b. Joints between concrete curbs and asphalt paving.
c. Other joints as indicated.

2. Joint Sealant: Hot-applied, single-component joint sealant.
3. Joint-Sealant Color: Manufacturer's standard.

C. Joint-Sealant Application: Fuel-resistant joints within concrete paving.

1. Joint Location:

a. Expansion and isolation joints in concrete paving.
b. Contraction joints in concrete paving.
c. Other joints as indicated.

2. Joint Sealant: Fuel-resistant, single-component, pourable, modified-urethane, elastomeric joint sealant. Fuel-resistant, multicomponent, pourable, modified-urethane, elastomeric joint sealant, Hot-applied, fuel-resistant, single-component joint sealant.
3. Joint-Sealant Color: Manufacturer's standard.

END OF SECTION

SECTION 329200 - TURF AND GRASSES

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. Seeding.
2. Turf renovation.

B. Related Requirements:

1. Section 334600 "Subdrainage" for below-grade drainage of landscaped areas.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. Product Certificates: For fertilizers, from manufacturer.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Five years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Pesticide Applicator: State licensed, commercial.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species:

1. Quality: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
2. Full Sun: Kentucky bluegrass (Poa pratensis), a minimum of three cultivars.
3. Sun and Partial Shade: Proportioned by weight as follows:

a. 50 percent Kentucky bluegrass (Poa pratensis).
b. 30 percent chewings red fescue (Festuca rubra variety).
c. 10 percent perennial ryegrass (Lolium perenne).
d. 10 percent redtop (Agrostis alba).

4. Shade: Proportioned by weight as follows:

a. 50 percent chewings red fescue (Festuca rubra variety).
b. 35 percent rough bluegrass (Poa trivialis).
c. 15 percent redtop (Agrostis alba).

2.2 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.4 PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install 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.

3.3 TURF AREA PREPARATION

A. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

B. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h).

1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
2. Do not use wet seed or seed that is moldy or otherwise damaged.
3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 3 to 4 lb/1000 sq. ft. (1.4 to 1.8 kg/92.9 sq. m).

C. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:3 with erosion-control blankets installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with erosion-control mats where indicated on Drawings; install and anchor according to manufacturer's written instructions.

F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

3.5 TURF RENOVATION

A. Renovate existing turf where indicated.

B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
2. Install new planting soil as required.

C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

E. Mow, dethatch, core aerate, and rake existing turf.

F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).

I. Apply initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches (100 mm) of existing soil. Install new planting soil to fill low spots and meet finish grades.

1. Initial Fertilizer: Slow-release fertilizer applied according to manufacturer's recommendations.

J. Apply seed and protect with straw mulch as required for new turf.

K. Water newly planted areas and keep moist until new turf is established.

3.6 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.

2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches (100 mm).

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow Kentucky bluegrass to a height of 1-1/2 to 2 inches (38 to 50 mm).
2. Mow turf-type tall fescue to a height of 2 to 3 inches (50 to 75 mm).

D. Turf Postfertilization: Apply slow-release fertilizer ater initial mowing and when grass is dry.

1. Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to turf area.

3.7 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory and accepted by Owner and Architect.

3.8 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.9 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

C. Remove nondegradable erosion-control measures after grass establishment period.

3.10 MAINTENANCE SERVICE

A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:

1. Seeded Turf: 90 days from date of Substantial Completion.

    a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

END OF SECTION

SECTION 330500 - COMMON WORK RESULTS FOR UTILITIES

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. This Section includes the following:

1. Piping joining materials.
2. Transition fittings.
3. Dielectric fittings.
4. Sleeves.
5. Identification devices.
6. Grout.
7. Flowable fill.
8. Piped utility demolition.
9. Piping system common requirements.
10. Equipment installation common requirements.
11. Painting.
12. Concrete bases.
13. Metal supports and anchorages.

1.3 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

C. PE: Polyethylene plastic.

D. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.
2. Identification devices.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.8 COORDINATION

A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.

C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Section 033000 "Cast-in-Place Concrete".

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness, unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.2 TRANSITION FITTINGS

A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

B. Transition Couplings NPS 1-1/2 (DN 40) and Smaller:

1. Underground Piping: Manufactured piping coupling or specified piping system fitting.

2. Aboveground Piping: Specified piping system fitting.

C. AWWA Transition Couplings NPS 2 (DN 50) and Larger:

1. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.

D. Plastic-to-Metal Transition Fittings:

1. Description: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint or threaded end.

E. Plastic-to-Metal Transition Unions:

1. Description: MSS SP-107, PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

F. Flexible Transition Couplings for Underground Nonpressure Drainage Piping:

1. Description: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.3 DIELECTRIC FITTINGS

A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Description: Factory fabricated, union, NPS 2 (DN 50) and smaller.

a. Pressure Rating: 250 psig (1725 kPa) at 180 deg F (82 deg C).
b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.

C. Dielectric Flanges:

1. Description: Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 (DN 65 to DN 100) and larger.

a. Pressure Rating: 300 psig (2070 kPa).
b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:
1. Description: Nonconducting materials for field assembly of companion flanges, NPS 2-1/2 (DN 65) and larger.

a. Pressure Rating: 300 psig (2070 kPa).
b. Gasket: Neoprene or phenolic.
c. Bolt Sleeves: Phenolic or polyethylene.
d. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. Description: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 (DN 80) and smaller.

a. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
b. End Connections: Threaded.

F. Dielectric Nipples:

1. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.

a. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
b. End Connections: Threaded or grooved.

2.4 SLEEVES

A. Mechanical sleeve seals for pipe penetrations are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

B. Galvanized-Steel Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.

D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.5 IDENTIFICATION DEVICES

A. General: Products specified are for applications referenced in other utilities Sections. If more than single type is specified for listed applications, selection is Installer's option.

B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
2. Location: Accessible and visible.

C. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive-vinyl type with permanent adhesive.

D. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Full-band pipe markers, extending 360 degrees around pipe at each location.

E. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.

F. Lettering: Manufacturer's standard preprinted captions as selected by Architect.

G. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils (0.08 mm) thick.

1. Width: 1-1/2 inches (40 mm) on pipes with OD, including insulation, less than 6 inches (150 mm); 2-1/2 inches (65 mm) for larger pipes.
2. Color: Comply with ASME A13.1, unless otherwise indicated.

H. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) sequenced numbers. Include 5/32-inch (4-mm) hole for fastener.

1. Material: 0.032-inch- (0.8-mm-) thick, polished brass or aluminum.
2. Size: 1-1/2 inches (40 mm) in diameter, unless otherwise indicated.

I. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.

J. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
2. Thickness: 1/16 inch (1.6 mm), for units up to 20 sq. in. (130 sq. cm) or 8 inches (200 mm) in length, and 1/8 inch (3 mm) for larger units.
3. Fasteners: Self-tapping, stainless-steel screws or contact-type permanent adhesive.

K. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Brown: Energy reclamation equipment and components.
4. Blue: Equipment and components that do not meet criteria above.
5. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
6. Terminology: Match schedules as closely as possible. Include the following:

a. Name and plan number.

b. Equipment service.
c. Design capacity.
d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

7. Size: 2-1/2 by 4 inches (65 by 100 mm) for control devices, dampers, and valves; 4-1/2 by 6 inches (115 by 150 mm) for equipment.

L. Plasticized Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with mat finish suitable for writing.

1. Size: 3-1/4 by 5-5/8 inches (83 by 143 mm).
2. Fasteners: Brass grommets and wire.
3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.

M. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in piped utility identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of piped utility systems and equipment.

1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

2.6 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.7 FLOWABLE FILL

A. Description: Low-strength-concrete, flowable-slurry mix.

1. Cement: ASTM C 150, Type I, portland.
2. Density: 115- to 145-lb/cu. ft. (1840- to 2325-kg/cu. m).
3. Aggregates: ASTM C 33, natural sand, fine.
4. Admixture: ASTM C 618, fly-ash mineral.
5. Water: Comply with ASTM C 94/C 94M.
6. Strength: 100 to 200 psig (690 to 1380 kPa) at 28 days.

PART 3 - EXECUTION

3.1 PIPED UTILITY DEMOLITION

A. Refer to Section 024119 "Selective Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.
3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.
5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 DIELECTRIC FITTING APPLICATIONS

A. Dry Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 (DN 50) and Smaller: Dielectric unions.
2. NPS 2-1/2 to NPS 12 (DN 65 to DN 300): Dielectric flanges or dielectric flange kits.

B. Wet Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 (DN 50) and Smaller: Dielectric couplings or dielectric nipples.
2. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Dielectric nipples.
3. NPS 2-1/2 to NPS 8 (DN 65 to DN 200): Dielectric nipples or dielectric flange kits.
4. NPS 10 and NPS 12 (DN 250 and DN 300): Dielectric flange kits.

3.3 PIPING INSTALLATION

A. Install piping according to the following requirements and utilities Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches (50 mm) above finished floor level.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

a. Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.

J. Verify final equipment locations for roughing-in.

K. Refer to equipment specifications in other Sections for roughing-in requirements.

3.4 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.

I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End PE Pipe and Fittings: Use butt fusion.
2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.

O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.5 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Install dielectric fittings at connections of dissimilar metal pipes.

3.6 EQUIPMENT INSTALLATION

A. Install equipment level and plumb, unless otherwise indicated.

B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.

C. Install equipment to allow right of way to piping systems installed at required slope.

3.7 PAINTING

A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.8 IDENTIFICATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
2. Locate pipe markers on exposed piping according to the following:

a. Near each valve and control device.
b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.

c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
d. At manholes and similar access points that permit view of concealed piping.
e. Near major equipment items and other points of origination and termination.

B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.

1. Lettering Size: Minimum 1/4 inch high for name of unit if viewing distance is less than 24 inches, 1/2 inch high for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.9 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. 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 base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 4000-psi, 28-day compressive-strength concrete and reinforcement as specified in Section 033000MB "Cast-in-Place Concrete”.

3.10 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Section 055000 "Metal Fabrications" for miscellaneous steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.11 GROUTING

A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION

SECTION 332455 – SANITARY SEWERS

1. RELATED DOCUMENTS

General provisions of the Contract, General, Supplemental and Special Conditions and General Requirements apply to this Section.

2. DESCRIPTION OF WORK

Provide labor, materials, equipment and services necessary for proper and complete installation of gravity sanitary sewers and miscellaneous appurtenances including all excavation; bedding; furnishing, joining and laying pipe; backfill according to these specifications; handling ground water flow in trenches, ditches and drains as required; protecting trees and shrubs; disposal of surplus materials; cleaning up; and all other work incidental to laying pipe and pipe fittings for items listed below:

(1) Sanitary sewer pipe.

The following items will be considered incidental, and no extra payment will be made:

Excavation of earth and rock, line and grade control, roadway and driveway surface replacement, dewatering, stone bedding and cover, earth or crushed stone backfill, preliminary and final cleanup, regrading, spreading topsoil and seeding.

All excavation for trenching is considered to be unclassified excavation. No additional payment will be made for rock excavation.

3. MATERIALS

A. Polyvinyl Chloride Pipe and Fittings (PVC):

(1) PVC pipe shall be extruded from Type I, Grade 1, polyvinyl chloride material designated as PVC 1120, meeting ASTM Specifications D3034, Type PSM, and have a standard dimension ratio of SDR 35 on SDR26 as specified on plans.

(2) Pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects. Pipe shall be as uniform as commercially practical in color.

(3) Workmanship, pipe dimensions and tolerances, outside diameters, wall thickness, eccentricity, sustained pressures, burst pressures, flattening, extrusion quality, marking and all other requirements of Commercial Standards CS 256-63 shall be complied with in all respects.

(4) Pipe shall have a bell on one end. Male ends of pipe must be beveled on the outside. Pipe shall have a ring painted around male end or ends in such a manner as to allow field checking of setting depth of pipe in the socket. This requirement is made to assist construction superintendents and inspectors in visual inspection of pipe installation.

(5) Pipe must be delivered to job site by means which will adequately support it and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe

shall be unloaded carefully and strung or stored as close to final point of placement as is practical. Pipe must not be exposed to direct rays of sun for an extended period of time. If pipe is not to be installed shortly after delivery to job site, it must be stored in shaded location and strung as needed.

(6) All pipe and fittings shall be clearly marked on the outside indicating name of manufacturer, nominal diameter, and specification classification.

4. SHOP DRAWINGS

Contractor shall furnish to Engineer for approval a PDF set of shop drawings, catalog cuts and certificates for all materials used in construction of sanitary sewers. Contractor should not order material or equipment until approval of shop drawings by Engineer.

5. TRENCH EXCAVATION

A. Trenching:

(1) Unless specifically approved or directed otherwise by Engineer, not more than 400 feet of trench shall be opened ahead of pipe laying work of one crew, and not more than 400 feet of open ditch shall be left behind pipe laying work of any one crew.

(2) Trenches in which pipes are to be laid shall be excavated in open cut to depths indicated on Drawings, cut sheets or as specified by Engineer. Minimum allowable trench width shall not be less than outside diameter of pipe plus twelve inches. Where rock is encountered, it shall be removed to a minimum depth of six inches below the pipe.

(3) Unless specifically authorized by Engineer, trenches shall in no case be excavated or permitted to become wider than 2 feet 6 inches plus nominal diameter of pipe at level or below top of pipe. If trench does become wider than 2 feet 6 inches at level of or below top of pipe, special precautions may be necessary, such as providing additional crushed stone or flowable fill. Contractor shall bear cost of such special precautions as necessary.

(4) All excavated materials shall be placed a minimum of 2 feet from edge of trench.

(5) Where conditions exist that may be conducive to slides or cave-ins, proper and adequate sheeting, shoring and bracing shall be installed to provide safe working conditions and to prevent damage to work.

(6) Trenches shall be kept free of water during laying of pipe and until pipeline has been backfilled. Removal of water shall be at Contractor's expense.

(7) Backfilling shall be as set out hereinafter.

(8) All trenching operations shall be in compliance with OSHA regulations and Commonwealth of Kentucky requirements.

(9) When excavated material is placed on paved roads, the contractor shall clean road with power broom at the end of each days work or as directed by the Engineer.

(10) When excavated material is placed on gravel or dirt roads, the contractor

replace crushed stone to the same thickness as pre-construction.

B. Shoring, Sheeting and Bracing:

(1) Where unstable material is encountered or where depth of excavation in earth exceeds five feet, sides of trench or excavation shall be supported by substantial sheeting, bracing and shoring, or side sloped to angle of repose. Sloping sides of ditch to angle of repose will not be permitted in streets, roads, narrow rights-of-way or other constricted areas unless otherwise specified. Design and installation of all sheeting, sheet piling, bracing and shoring shall be based on computations of pressure exerted by materials to be retained under construction conditions. Adequate and proper shoring of all excavations shall be the entire responsibility of Contractor.

(2) Foundations, adjacent to where excavation is to be made below depth of existing foundation, shall be supported by shoring, bracing, or underpinning as long as excavation shall remain open, or thereafter if required to insure stability of structure supported by the foundation, and Contractor shall be held strictly responsible for any damage to said foundation.

(3) Solid sheeting will be required for wet or unstable material. It shall consist of continuous vertical sheet piling of timber or steel with suitable whales and braces.

(4) Care shall be taken to avoid excessive backfill loads on the completed pipelines and the requirements that width of trench at level of crown of pipe be not more than two feet six inches plus nominal diameter of pipe shall, as set out hereinbefore, shall be strictly observed.

(5) Trench sheeting shall not be removed until sufficient backfill has been placed to protect the pipe.

(6) All sheeting, shoring, planking, timbering, bracing and bridging shall be placed, renewed and maintained as long as necessary.

(7) Nothing in this Section shall override any requirements of OSHA or of the Commonwealth of Kentucky.

C. Blasting is not permitted.

6. PIPE BEDDING

A. General:

(1) In all cases foundation for pipes shall be prepared so that entire load of backfill on top of pipe will be carried on barrel of pipe and where bell and spigot pipe are involved, none of load will be carried on bells.

(2) For bell and spigot pipe, bell holes shall be cut in granular bedding to prevent bells from being supported on undisturbed earth or granular material.

(3) Supporting of pipe shall be as set out hereinafter, and in no case shall the supporting of pipe on blocks be permitted.

B. Earth Foundations:

Foundations for pipes laid in trenches shall be prepared so that entire load of backfill on top of pipe will be carried uniformly on barrel of pipe. Pipe bells shall not carry any load of backfill. Excavation shall be undercut to a minimum depth of four inches below bottom of pipe. Pipe shall be laid on a bed of granular material to provide continuous support for the lower section of pipe. Granular bedding shall be #9 crushed stone.

C. Rock Foundation:

If trench bottom is in rock, excavation shall be undercut to a minimum depth of six inches below bottom of pipe. Pipe shall be laid on a bed of granular material to provide continuous support for the lower section of pipe. Granular bedding shall be #9 crushed stone.

D. Special Bedding:

(1) In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of pipe might take place during placing of backfill, pipe must be weighted or secured permanently in place by such means as will prove effective. Yielding and mucky material in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for pipe, and backfilled with compacted #9 crushed stone.

7. PIPE LAYING

A. Laying of sewer pipe in finished trenches shall commence at lowest point so that spigot or tongue ends point in the direction of flow.

B. Contractor shall use a laser instrument to set grades on sewer lines. In using such an instrument, Contractor shall be responsible for maintaining grades and elevations as called for on drawing profiles, and any variances found shall be corrected by Contractor at no additional cost to Owner.

C. All pipe lengths shall be laid with ends abutting and true to line and grade as given by Engineer. They shall be fitted and matched so that when laid they will form a sewer with a smooth and uniform invert. Foundation of pipe shall be as set out hereinbefore under "Pipe Bedding" and in no case shall supporting of pipe on blocks be permitted.

D. Branches, fittings and specials for sewer lines shall be provided and laid as and where indicated on Drawings.

E. Before each piece of pipe is lowered into trench, it shall be thoroughly cleaned and inspected. Each piece of pipe shall be lowered separately. No piece of pipe or fitting which is known to be defective shall be laid or placed in trenches. If defective pipe or fitting shall be discovered after pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting. In case a length of pipe is cut to fit in a line, it shall be so cut to leave a smooth end at right angles to longitudinal axis of pipe.

F. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a suitable plug, fitted into pipe bell, so as to exclude earth or other material, and precautions taken to prevent floatation of pipe by runoff into trench.

8. BACKFILLING

A. General:

(1) All backfilling shall be accomplished in accordance with detail drawings and the requirements of this section. Any variances must be approved in writing by Engineer.

(2) Contractor shall add water to backfill material or dry out material when needed to attain a condition near optimum moisture content for a maximum density of material when it is tamped. Contractor shall obtain a compaction of the backfill of at least 95 percent of a standard (ASTM D698) Proctor density where mechanical tamping of backfill is required.

(3) Before final acceptance, Contractor will be required to level off all trenches or to bring trench up to level of surrounding terrain. Contractor shall also remove from roadways, rights-of-way and/or private property all excess earth or other materials resulting from construction.

(4) Contractor shall be responsible for maintaining trench surface in a level condition at proper pavement grade at all times.

(5) In all cases walking or working on completed pipelines except as may be necessary in tamping or backfilling will not be permitted until trench has been backfilled to a point one foot above top of pipe. Filling of the trench and tamping of backfill shall be carried on simultaneously on both sides of the pipe in such a manner that completed pipeline will not be disturbed and injurious side pressures do not occur.

B. Method "A" Backfilling in Open Terrain (AREAS NOT SUBJECT TO VEHICULAR TRAFFIC)

(1) Backfilling of pipeline trenches in open terrain shall be accomplished in the following manner:

Lower portion of trench, from pipe bedding to a level plane 6 inches above top of pipe shall be backfilled with #9 crushed stone.

(2) Upper portion of trench above the crushed stone shall be backfilled with select soil material which is free from large rock, debris and organics. The trench backfill shall be level.

C. Settlement of Trenches:

The Contractor shall be responsible for any trench settlement which occurs within one year from time of final acceptance of all work in the project. If paving shall require replacement because of trench settlement, within this time, it shall be replaced by Contractor. Repair of settlement damage shall meet approval of appropriate governing body.

9. TESTING SANITARY SEWERS

A. General:

(1) After collection and/or outfall lines have been brought to completion, and prior to final inspection, Contractor shall rod out entire system by pushing through each individual line in system, from manhole to manhole, appropriate tools for removal of any and all dirt, debris and trash.

(2) All lines or sections of lines that are found to be laid improperly with respect to line or grade, that are found to contain broken or leaking sections of pipe, or are obstructed in such a manner that they cannot be satisfactorily corrected otherwise, shall be removed and replaced.

(3) Contractor shall furnish all labor and equipment necessary to conduct tests, and shall record test results for each section of sewer pipe and/or manhole.

(4) Owner must witness each test before it will be accepted as fulfilling requirements of these specifications.

B. Low Pressure Air Test:

(1) All sanitary sewers will receive a low-pressure air test for leakage. Air test will be made 30 days after all sewer lines have been backfilled, compacted and completed.

(2) All ties and end of sewer services shall be plugged with flexible joints plugs or end caps securely fastened to withstand internal test pressures. Such plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

(3) Prior to testing, pipe shall be checked to see that it is clean. If not, it shall be cleaned by passing a full gauge squeegee through the pipe. It shall be Contractor's responsibility to clean the pipe.

(4) Immediately following this check or cleaning, pipe installation shall be tested with low-pressure air. Air shall be slowly supplied to plugged pipe installation until internal air pressure reaches 4.0 psi. At least two minutes shall be allowed for temperature stabilization.

(5) Requirements of air test shall be considered satisfied provided that the time required for the pressure to decrease 1.0 psi is not less than that shown in the "Allowable Time Table" below.

ALLOWABLE TIME TABLE

PIPE SIZE	MIN.	SEC.
6"	5	40
8"	7	34
10"	9	26

12"	11	20

C. Deflection Test:

(1) Deflection tests shall be performed on all sewers at least 30 days after they have been constructed. If the deflection test is to be run using a rigid ball or mandrel, it shall have a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices. Pipe deflection shall be measured and recorded by the CONTRACTOR in the presence of the Special Inspector and/or Owner. Equipment required for the test shall be provided by the Contractor.

(2) Any sewer line exceeding 5% of deflection shall be replaced

11. CLEAN-UP

Upon completion of installation of section of sewer lines, remove all debris and surplus construction materials. Grade ground surface along each side of pipe trench in a uniform and neat manner leaving construction area in a shape as near as possible to original ground line and apply seed & straw as specified elsewhere.

END OF SECTION 332455

SECTION 332510 - WATERLINES

1. RELATED DOCUMENTS

General Provisions of Contract, General, Supplemental and Special Conditions, and General Requirements apply to this Section.

2. DESCRIPTION OF WORK

Provide labor, material, equipment and services necessary for proper and complete installation of water pipe, connections, meters and miscellaneous appurtenances including all excavation; bedding; furnishing, joining and laying pipe; backfill according to these specifications; handling ground water flow in trenches, ditches and drains as required; protecting trees and shrubs; disposal of surplus materials; cleaning up; and all other incidental work.

The following items are considered incidental, and no extra payment will be made:

Excavation of earth and rock, line and grade control, roadway and driveway surface replacement, dewatering, stone bedding and cover, earth or crushed stone backfill, preliminary and final cleanup, regrading, spreading topsoil and seeding.

All excavation for trenching is considered unclassified excavation. No additional payment will be made for rock excavation.

3. MATERIALS

A. Polyvinyl Chloride Pipe (PVC)

(1) Standard Polyvinyl Chloride Pipe

a. Polyvinyl Chloride Pipe shall conform to ASTM Specification D-2241, latest revision. Pipe shall be Class 200 pressure rated (SDR21). Pipe material shall conform to latest revisions of ASTM D-1784 (PVC pipe compounds), ASTM D-2241 (PVC plastic pipe, SDR), and ASTM D-2672 (Bell-End PVC pipe).

b. Joints for PVC pipe shall conform to latest revision of ASTM D-3139, (joints for plastic pressure pipes using flexible elastomeric seals). Joints shall be bells that consist of an integral wall section with a locked-in, solid cross section elastomeric ring which meets requirements of ASTM F-477. Bell sections shall be at least as hydrostatically strong as pipe wall.

(2) All bends and other fittings shall be restrained with concrete thrust blocks, lock gaskets, and grip rings to accommodate outside diameter of PVC pipe.

(3) Lubrication for rubber connected joints and fittings shall be water soluble,

non-toxic, non-objectionable in taste and odor and have no deteriorating effect on PVC or gaskets and shall be supplied by pipe manufacturer.

(4) All PVC pipe and fittings shall bear National Sanitation Foundation (NSF) approved seal for potable water.

B. Marking Tape

Tape shall consist of a solid aluminum foil coil encased in a protective plastic jacket. The materials and ink color shall not change when exposed to the alkalis, acids and other destructive chemical variances commonly found in soil. The foil coil shall be visible to ensure continuity. Tape shall be a minimum width of 2 inches and colored blue with the word “water” marked on the tape. The minimum thickness shall be 5.5 mils with a minimum tensile strength of 4000 psi. Tape shall be installed a minimum of one foot above the top of the pipe.

4. SHOP DRAWINGS

Contractor shall furnish one (1) PDF copy via e-mail to Engineer for review of shop drawings, catalog cuts and certifications for all materials used in construction of water lines. Contractor shall not order material or equipment until approval is given by Engineer.

5. EXCAVATION FOR TRENCHES

A. Except as otherwise noted, trenches in which water lines are to be laid shall be excavated in open cut to depths as indicated on Drawings. In general, this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting lower quadrant of pipe to be bedded in undisturbed ground, and excavation in rock shall extend below invert elevation a distance to accommodate a layer of bedding material as specified elsewhere in this section.

B. When excavated material is placed on paved roads, the contractor shall clean road with power broom at the end of each day’s work.

C. When excavated material is placed on gravel or dirt roads, the contractor shall place crushed stone to the same thickness of the road prior to construction.

D. If foundation is good firm earth and machine excavation has been accomplished as set out hereinbefore, remainder of material shall be excavated by hand and earth pared or molded to give full support to lower quadrant of barrel of each pipe. Where bell and spigot pipe are involved, bell holes shall be excavated during this latter operation to prevent bells from being supported on undisturbed earth. If for any reason machine excavation in earth is carried below an elevation that will permit type of bedding specified, then a layer of granular material shall be placed so that lower quadrant of pipe will be securely bedded in granular fill.

E. If foundation is rock and excavation has been undercut as set out hereinbefore, a bed of No. 9 crushed stone or tamped earth shall be placed to provide continuous

support for lower quadrant of pipe. No extra payment will be made for this No. 9 crushed stone.

F. Trenches shall be a minimum width of 12 inches plus to diameter of the pipe to provide free working space on each side of pipe and to permit proper backfilling around pipe, but trenches shall in no case be excavated or permitted to become wider than 2'-0" plus nominal diameter of pipe at level of or below top of pipe. If trench does become wider than 2' plus nominal diameter of pipe at level of or below top of pipe, special precautions may be necessary such as providing compacted, granular fill up to top of pipe or providing pipe with additional crushing strength after taking into account actual trench loads that may result and strength of pipe being used; Contractor shall bear the cost of such special precautions as are necessary.

Trenches cut in roads and streets shall not exceed a maximum width of 3'-6" plus nominal diameter of pipe at level of road or street surface.

G. Not more than 1000 feet of trench shall be opened ahead of pipe laying work of any one crew, and not more than 1000 feet of open ditch shall be left behind pipe laying work of any one crew. Watchmen or barricades, lanterns and other such signs and signals as may be necessary to warn public of dangers in connection with open trenches, excavations and other obstructions, shall be provided by and at expense of Contractor.

H. Pipe laying operation shall be continuous from beginning to end with no gaps allowed in the line.

6. REMOVAL OF WATER

Contractor, at his own expense, shall provide adequate facilities for promptly and continuously removing water from all excavation.

7. UNAUTHORIZED EXCAVATION

Whenever excavation is carried beyond or below required lines and grades, Contractor, at his own expense, shall refill said excavated space with suitable material.

8. LAYING DEPTHS FOR WATER MAINS

A. In general, water mains shall be laid with a minimum cover of 36 inches, or as indicated on Drawings.

B. When water lines are constructed in the R.O.W. of state roads, the minimum cover shall be 42 inches.

9. PIPE BEDDING

A. Foundation for pipes laid in trenches shall be prepared so that entire load of backfill on top of pipe will be carried uniformly on barrel of pipe. Pipe bells shall not carry

any load of backfill.

B. Pipe shall be bedded on four (4) inches of No. 9 crushed stone. No extra payment will be made for rock excavation or No. 9 crushed stone.

C. When wet, mucky, yielding or otherwise unsuitable material is located below proposed pipe bedding elevation, such material shall be removed and replaced with No. 9 compacted crushed stone.

10. PIPE LAYING

A. All pipe shall be laid with ends abutting and true to lines indicated on Drawings. Pipe shall be fitted and matched so that it will provide a smooth and uniform invert and be centered in the trench. All pipe shall be laid uphill when grade exceeds five percent.

B. Fittings and special attachments for water main shall be provided and laid as pipe is laid as indicated on Drawings.

C. Before each piece of pipe is lowered into trench, it shall be thoroughly swabbed out to insure its being clean. Any piece of pipe or fitting which is known to be defective shall not be laid or placed in trench. If defective pipe or fittings shall be discovered after pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to longitudinal axis of pipe.

D. Jointing shall be accomplished in accordance with the manufacturer's recommendations.

E. Interior of pipe shall be cleaned of dirt, jointing materials, and superfluous materials of every description. When laying pipe is stopped for any reason, exposed end of pipe shall be plugged so as to exclude earth, water or other material. Precautions must be taken to prevent floatation of pipe by runoff into trench.

F. Anchorage of Bends, Tees, Plugs, Hydrants and Valves

(1) At all bends of 11-1/4° and greater, and at reducers or in fittings where changes in pipe diameter occur, movement shall be prevented by using suitable harness, thrust blocks or ballasts. Thrust blocks and supports shall be of sufficient volume of concrete to prevent movement, care shall be taken to leave weep holes unobstructed and allow for future repair.

(2) Steel rods and clamps shall be galvanized or otherwise rust-proofed.

(3) No extra pay shall be allowed for work on proper anchorage of pipe, fittings or other appurtenances; such items shall be included in unit price bid for supported item.

G. In cold weather, extra caution shall be used in handling and laying PVC pipe.

H. No more pipe then can be used in one week shall be strung out in advance.

11. BACKFILLING PIPELINE TRENCHES

A. Backfilling pipeline trenches shall be accomplished in accordance with methods outlined hereinafter, and as indicated on Drawings. In all cases, walking or working on the completed pipelines, except as may be necessary in tamping or backfilling, will not be permitted until trench has been backfilled to a point one (1) foot above top of pipe. Filling of trench shall be carried on simultaneously on both sides of the pipe in such a manner that completed pipeline will not be disturbed and injurious side pressures do not occur.

The methods of backfilling shall be as follows:

Method A - Areas Not Subject to Vehicular Traffic

The lower part of the trench up to a point six (6) inches above the pipe shall be backfilled with No. 9 Crushed Stone. The remainder of the trench shall be backfilled with earth free from large rock and properly compacted, or with crushed stone when a condition exists as mentioned in Paragraph B, this article.

Method B – Parking Lots and Drives
(Open Cut Method)

The entire trench shall be backfilled with No. 9 Crushed Stone.

B. In areas where large quantities of rock are excavated, and the available excavated earth in the immediate vicinity is insufficient for placing the required amount of backfill over the top of pipe as set forth in Method A this article, then the Contractor must either haul in earth or order crushed stone aggregate for backfilling over the top of the pipe. Neither the hauling in and placing of earth nor the ordering and placing of crushed stone aggregate to fulfill the backfill requirements set forth in the aforesaid Method A is considered a pay item.

C. The Contractor shall add water to the backfill material or dry out the material when needed to attain a condition near optimum moisture content for a maximum density of the material when it is tamped. The Contractor shall obtain a compaction of the backfill of at least 90 percent of standard (ASTM D-698) Proctor density where mechanical tamping of backfill is required.

12. CLEAN-UP

Contractor shall remove all debris and surplus construction materials resulting from his work on a daily basis. Contractor shall grade ground along each side of pipe trench in a uniform and neat manner leaving construction area in a shape as near as possible to original ground line.

13. CONNECTION TO EXISTING SYSTEM

A. Contractor shall connect the new waterline to the existing water system. The Contractor must notify the water company when the connection is to be made so that representatives of the water company may operate existing valves and witness the connection. A minimum notice of 72 hours must be given.

15. SEEDING, FERTILIZING AND MULCHING

Trenches in areas that are not paved shall be prepared for seeding. Materials and methods for seeding, fertilizing and mulching are described elsewhere in these specifications.

16. RESTORATION

A. In general, contractor shall be responsible for proper care and maintenance of all existing structures, both above and below surface, which are encountered during progress of work. No structures of any kind shall be removed.

B. Contractor shall care for and maintain all pipes and services for gas, sewer, telephone or electricity where same are encountered in prosecution of work. In event any such services for water, gas, electricity, sewer or telephone are disturbed, damaged or destroyed, Contractor shall arrange with owner of such service, or facility, for its replacement and restoration at Contractor's expense.

17. TESTING

A. Water mains, services and all appurtenances shall be tested to 1.5 times the working pressure of the pipe or a minimum of 150 psi. Items found to be defective shall be replaced by the contractor with sound material. Test shall be repeated until results are satisfactory.

B. Requirements of pressure test shall be considered satisfied if the pressure drops less than 5 psi in 4 hours.

C. All leaks shall be repaired whenever or wherever there is evidence of a leak. Water used by Contractor shall be paid for by Contractor at the rate determined by the water company.

D. Contractor shall furnish all labor and equipment necessary to conduct test, and shall record test results for each section of waterline.

E. Water company and/or owner’s represetative must witness test before it will be accepted as fulfilling requirements of these specifications.

18. DISINFECTION OF WATER LINES

A. New potable water lines shall not be placed in service, either temporarily or

permanently, until they have been thoroughly disinfected in accordance with the following requirements and to the satisfaction of the water company.

B. After testing, a solution of hypochlorite using HTH or equal shall be introduced into the section of the line begin disinfected sufficient to insure a chlorine dosage of at least 50 ppm in the main. While the solution is being applied, the water should be allowed to escape at the ends of the line until tests indicate that a dosage of at least 50 ppm has been obtained throughout the pipe. Open and close all valves and cocks while chlorinating agent is in the piping system. The chlorinated water shall be allowed to remain in the pipe for 24 hours, after which a residual of at least 25 ppm shall be obtained. The disinfection shall be repeated until 25 ppm is obtained, after which time the main shall be thoroughly flushed until the residual chlorine content is not greater than 1.0 ppm. Contractor shall have testing equipment for testing chlorine content.

C. Following disinfection of the line, bacteriological samples shall be collected and analyzed in accordance with the requirements of Kentucky Department for Natural Resources and Environmental Protection. When the samples have been approved, the new line then may be connected to the system. Cost of collecting and analyzing samples shall be paid by Contractor.

END OF SECTION

SECTION 334105 - DRAIN PIPE

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. Pipe and fittings.

1.3 DEFINITIONS

A. HDPE: High Density Polyethylene plastic.

B. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

B. Field quality-control reports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Developer or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than two (2) days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 HDPE PIPE AND FITTINGS

A. Corrugated HDPE Pipe and Fittings: AASHTO M 294M, Type S, with smooth waterway for coupling joints.

1. Use dual wall HDPE pipe.

2.2 PVC PIPE AND FITTINGS

A. PVC Pipe and Fittings

1. Pipe
   a. ASTM D 1785, Schedule 40 PVC, with plain end solvent-cemented joints.
   b. ASTM D 1784, SDR35 PVC, with gasketed bell to spigot joints.

2. Fittings:
   a. ASTM D 2466, Schedule 40 PVC, socket type.
   b. ASTM D 3034, SDR35 PVC, gasketed bell to spigot type.

2.3 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443, rubber.
2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.

C. Unshielded, Flexible Couplings:

1. Description: Elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.4 CONCRETE

A. General: Cast-in-place concrete according to ACI 318/318R, 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: 3500 psi minimum with 0.49 maximum water-cementitious materials ratio.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

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 into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

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.

C. Install 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.

D. Install gravity-flow, nonpressure drain pipe according to the following:

1. Install piping pitched down in direction of flow.
2. Install piping with 18-inch minimum cover.
3. Install HDPE corrugated sewer piping according to ASTM D 2321.
4. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join corrugated HDPE piping according to ASTM D 3212 for push-on joints.
2. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
3. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.5 CONNECTIONS

A. Connect nonpressure, gravity-flow drain pipe to building's downspouts with boot matching adjacent park buildings.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

3.6 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at substantial completion of Project.

1. 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. Damage: Crushed, broken, cracked, or otherwise damaged piping.

d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

2. Reinspect and repeat procedure until results are satisfactory.

B. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.

3.7 CLEANING

Clean interior of piping of dirt and superfluous materials.

END OF SECTION 334105

APPENDIX A – SPECIFICATIONS AND STANDARDS OF THE GOVERNING AUTHORITIES

1.1 KENTUCKY TRANSPORTATION CABINET (KYTC)

A. The KYTC Standard Drawings are part of these specifications and are readily available at http://transportation.ky.gov/highway-design/pages/standard-drawings.aspx. Contractor must keep a copy of the KYTC Standard Drawings on-site for reference.

B. The KYTC Standard Specifications for Road Construction are part of these specifications and are readily available at http://transportation.ky.gov/Construction/Pages/Kentucky-Standard-Specifications.aspx. Contractor must keep a copy of the KYTC Standard Specifications for Road Construction on-site for reference.

1.2 KENTUCKY EROSION PREVENTION AND SEDIMENT CONTROL (KEPSC)

A. The KEPSC Best Management Practices (BMP) manual is part of these specifications and is readily available at http://www.kyt2.com/publications. Contractor must keep a copy of the KEPSC BMP manual on-site for reference.

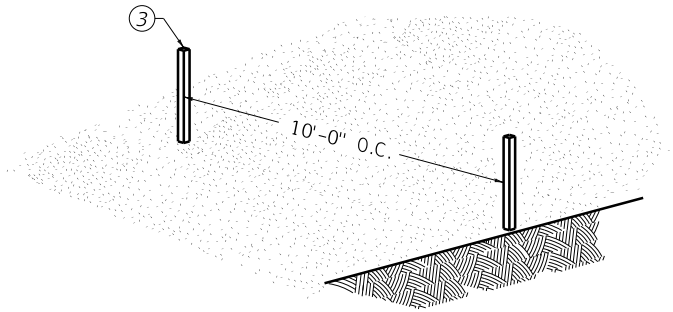
1.3 HARDIN COUNTY WATER DISTRICT #2

A. The Hardin County Water District #2 waterline construction standards and specifications are part of these specifications and are readily available at https://www.hardincountywater2.org/specifications.asp. Contractor must keep a copy of these standards and specifications on-site for reference.

1.4 NOLIN RURAL ELECTRICAL CO-OP (NOLIN)

A. The Nolin Rural Electrical Co-op (Nolin RECC) construction standards and specifications are part of these specifications and is readily available at https://nolinrecc.com/diagrams-and-specs/. Contractor must keep a copy of these standards and specifications on-site for reference.

1.5 SELECTED SPECIFICATIONS AND STANDARDS OF THE GOVERNING AUTHORITIES THAT ARE REFERENCED IN THE SITE PLANS ARE ATTACHED.



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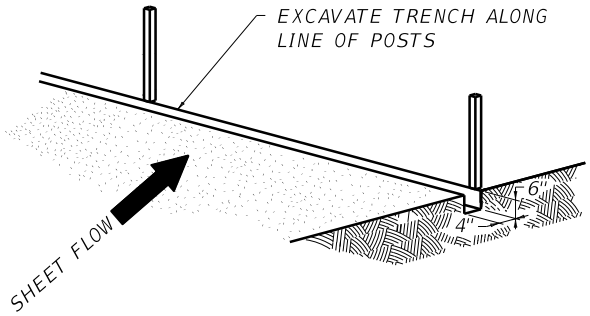

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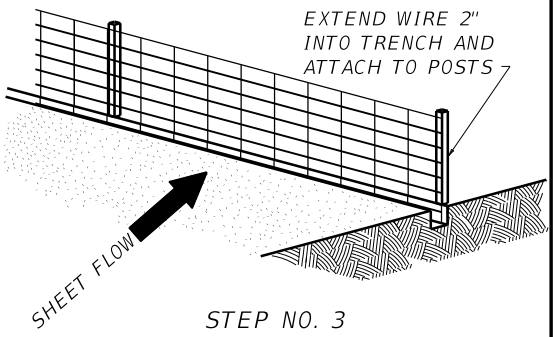

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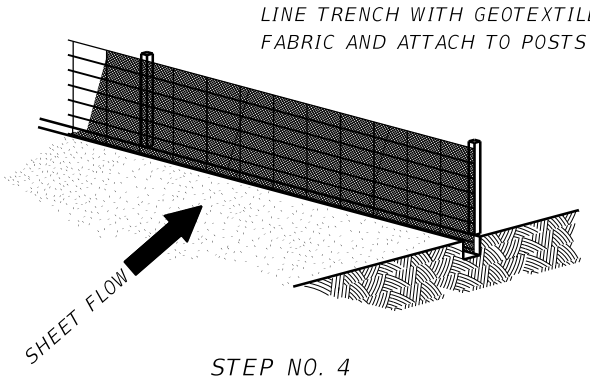

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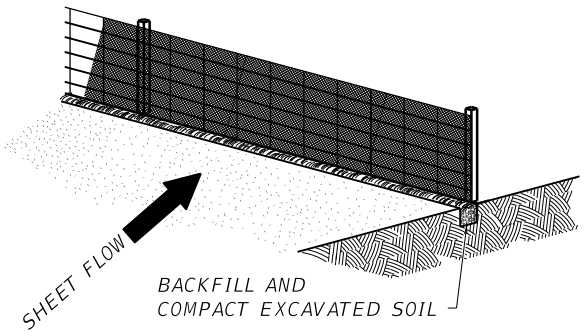

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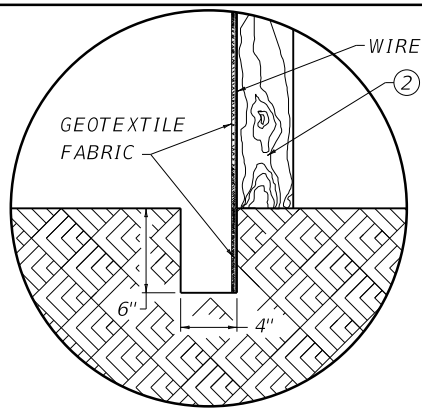


SECTIONAL DETAIL

~ NOTES ~

BID ITEM AND UNIT TO BID
TEMP SILT FENCE LF

1. SEE STANDARD SPECIFICATIONS FOR POST SIZE, WOVEN WIRE FENCE FABRIC, GEOTEXTILE FABRIC, WIRE STAPLE AND ALL OTHER PERTINENT INFORMATION.

(2) POSTS MAY BE WOODEN OR METAL T-SECTION.

(3) POSTS SHALL BE SET 1'-4" DEEP.

KENTUCKY
DEPARTMENT OF HIGHWAYS

TEMPORARY SILT FENCE WITH WOVEN WIRE FENCE FABRIC

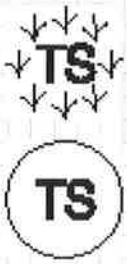
STANDARD DRAWING NO. RDX-215-01

SUBMITTED _____ DIRECTOR, DIVISION OF DESIGN 12-01-15 DATE

APPROVED _____ STATE HIGHWAY ENGINEER 12-01-15 DATE

4.4.1 Temporary Seeding

Temporary seeding and/or mulching is necessary for bare areas that have not been worked for 14 or more consecutive days, according to state and local regulations.



Definition

Temporary seeding uses rapidly growing grass to stabilize disturbed areas that have not reached final grade. Areas that will be inactive for 14 days or more must be seeded and mulched.

Purpose

Temporary seeding serves to reduce problems associated with muddy runoff or dust from bare soil surfaces during construction and to maintain sheet flow, protect the soil surface, and promote infiltration into the soil; to protect the soil and prepare it for permanent seeding at a later date; and to reduce aesthetic and other concerns regarding water quality and visual impacts associated with construction areas.

Design Criteria

The area must be protected from excess run-on from upgradient areas as necessary with diversions or berms. Plant species must be selected on the basis of quick germination, growth, and time of year to be seeded. Fertilizer, lime, seedbed preparation, seed coverage, mulch, and irrigation must be used as necessary to promote quick plant growth.

Mulch should be specified for sites with slopes greater than five percent (20H:1V) and slope lengths greater than 100 feet.

Construction Specifications

Site Preparation

Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application, and anchoring.

Install the needed erosion control practices before seeding such as diversions ditches and berms.

Do not apply fertilizer, lime, or seed before heavy rain storms (e.g., predicted to be one-half inch or more in one hour or less).

Seedbed Preparation

Mix seed, mulch, and other material for application via hydraulic spray equipment or follow the procedure below.

Spread lime (in lieu of a soil test recommendation) on acid soil (pH 5.5 or lower) and subsoil at a rate of one ton per acre of agricultural ground limestone. For best results, test soil pH and fertility—this can

reduce the expense of unneeded lime and fertilizer and potential excess nutrient loss through runoff and leaching.

Fertilizer (in lieu of a soil test recommendation) must be applied at a rate of no more than 800 pounds per acre of 10-10-10 analysis or equivalent.

Work the lime and fertilizer into the soil with a disk harrow, springtooth harrow, or similar tools to a depth of two inches. On sloping areas, the final operation must be on the contour.

Seeding Rates for Temporary Site Protection

March 1 to October 31	Per 1,000 Square Feet	Per Acre
1. Oats	3 lbs.	120 lbs.
2. Perennial Ryegrass	1 lbs.	40 lbs.
3. Tall Fescue	1 lbs.	40 lbs.
4. Wheat	3 lbs.	120 lbs.
5. Annual Rye	3 lbs.	120 lbs.
November 1 to February 28	**Per 1,000 Square Feet**	**Per Acre**
1. Annual Rye	3 lbs.	120 lbs.
2. Wheat	3 lbs.	120 lbs.
3. Perennial Ryegrass	1 lb.	40 lbs.
4. Tall Fescue	3 lbs.	120 lbs.

Apply the seed uniformly with a cyclone seeder, drill, or hydroseeder (slurry can include seed and fertilizer) preferably on a firm, moist seedbed. Seed no deeper than one-fourth inch to one-half inch.

When feasible, except where a cyclone type seeder is used, the seedbed should be firmed following seeding operations with a cyclone, roller, or light drag. On sloping land, seeding operations should be on the contour wherever possible.

Triple the seeding rate for all ditches that will carry flowing water; cover seed with erosion control blanket or turf reinforcement mat if needed to prevent ditch erosion.

Inspection and Maintenance

Water the soil until the grass is firmly established. This is especially needed when seedings are made late in the planting season, in abnormally dry and hot seasons, or on sites with steep slopes or other adverse conditions.

Prepare spot repairs by working soil where seed establishment is poor, applying additional seed, and covering with mulch or erosion control blanket. Water area during dry conditions.

Designate haul roads and material storage areas on large sites, and seed or mulch the rest to minimize the amount of bare areas exposed to the weather. KPDES regulations require that portions of the site that have not been worked for 14 consecutive days be temporarily or permanently stabilized with seed and/or mulch.

4.4.2 Permanent Seeding

Establishing grass through broadcast or hydro-seeding reduces erosion and sediment loss by more than 90 percent. Use mulch on short flatter slopes and erosion control blankets or hydro-mulch on long steep slopes.

Definition

Permanent seeding is the establishment of permanent, perennial vegetative cover—usually grass—on disturbed areas. Permanent seeding must be applied to disturbed areas within 14 days of reaching final grade if no temporary cover is applied.

Purpose

Permanent seeding is intended to maintain sheet flow, promote infiltration, and reduce problems associated with muddy runoff or dust from bare soil surfaces during construction; to reduce sediment runoff to downstream areas and improve the visual aesthetics of the construction area; and to provide permanent site stabilization in preparation for completion of the project.

Design Criteria

The area must be protected from excess runoff as necessary with upgradient diversion berms or ditches. Plant species must be selected on the basis of quick germination, growth, and time of year to be seeded. Fertilizer, lime, seedbed preparation, seed coverage, mulch, and irrigation must be applied as necessary to promote quick plant growth.

Construction Specifications

Site Preparation

Soil should be capable of supporting permanent vegetation and have at least 25 percent silt and clay to provide an adequate amount of moisture holding capacity. An excessive amount of porous sand will not consistently provide sufficient moisture for good growth regardless of other soil factors.

- Plan to seed all areas as soon as final grade is reached, to take advantage of soil seedbed conditions and to minimize erosion potential.
- Where compacted soils occur, they should be broken up sufficiently to create a favorable rooting depth of 6–8 inches.
- Stockpile topsoil to apply to sites that are otherwise unsuited for establishing vegetation. Approximately 400 cubic yards of topsoil per acre are needed for application depths of 3 inches (~9.3 cubic yards per 1,000 square feet).
- Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application and anchoring, and maintenance. After the grading operation, spread topsoil where needed.

- Install the needed erosion control practices, such as diversion berms and ditches.

Seedbed Preparation

Spread lime (in lieu of a soil test recommendation) on acid soil and subsoil, at a rate of one ton per acre of agricultural ground limestone. For best results, test the soil—this can reduce the expense of unneeded lime and fertilizer and potential excess nutrient loss through runoff and leaching.

Fertilizer (in lieu of a soil test recommendation) should be applied at a rate of no more than 800 pounds per acre of 10-10-10 analysis. For best results, test the soil to determine fertilizer requirements. In limestone areas with streams and rivers impacted by high algae concentrations, use 10-0-10 fertilizer.

Work the lime and fertilizer into the soil with a disk harrow, springtooth harrow, or other suitable field equipment to a depth of 4 inches. On sloping land, the final operation must be on the contour.

Kentucky Transportation Cabinet Seed Mixes

Mixture Type	Seed Mixture
Mixture No. I	75% Kentucky 31 Tall Fescue 10% Red Top 5% White Dutch Clover 10% Ryegrass (perennial)
Mixture No. III	30% Kentucky 31 Tall Fescue 15% Red Top 15% Partridge Pea 20% Sericea Lespedeza 10% Sweet Clover – Yellow 10% Ryegrass

KYTC does not specify the seeding rate but requires that sufficient seed be applied to ensure a "dense, uniform vegetative cover."

Recommended Seeding Rates and Other Information for Various Species and Seed Mixtures

Seed species & mixtures	Seeding rate/acre	Per 1000 sq. ft	Soil pH	Other Information
Seed and seed mixtures for relatively flat or slightly sloping areas				
Perennial ryegrass	25 to 35 lbs	1 lb	5.6 to 7.0	Apply lime at 2 tons per acre if soil pH is below 5.5; use 400-800 lb fertilizer (10-10-10) on poor soils. Use wildflower mixes to save on mowing and watering costs.
+ tall fescue	15 to 30 lbs	1 lb	5.5 to 7.5	
Tall fescue	40 to 50 lbs	1.5 lb		
+ ladino or white clover	1 to 2 lbs	2 oz		
Steep slopes, banks, cuts, and other low maintenance areas (not mowed)				
Smooth bromegrass	25 to 35 lbs	1 lb	5.5 to 7.5	Track steep slopes with dozer up and down hill before seeding. Mulch slopes after seeding with 2 to 3 tons of straw or 6 tons of wood chips per acre. Use tackifier on mulch, disk it in, or punch in with sheep-foot roller. Disk or sheep-foot on the contour (across slope, on the level). For extremely steep slopes, use erosion control blankets after seeding. Use 20" spacing on blanket staples
+ red clover	10 to 20 lbs	0.5 lb		
Tall fescue	40 to 50 lbs	1 lb	5.5 to 7.5	
+ white or ladino clover	1 to 2 lbs	2 oz		
Orchardgrass	20 to 30 lbs	1 lb	5.6 to 7.0	
+ red clover	10 to 20 lbs	0.5 lb		
+ ladino clover	1 to 2 lbs	2 oz		
Crownvetch	10 to 12 lbs	0.25 lb	5.6 to 7.0	
+ tall fescue	20 to 30 lbs	1 lb		
Seed species & mixtures	**Seeding rate/acre**	**Per 1000 sq. ft**	**Soil pH**	**Other Information**
Lawns and other high traffic or high maintenance areas (mowed)				

Bluegrass	105 to 140 lbs	3 lb	5.5 to 7.0	Use wildflower mixes to save on mowing and watering costs. Do not establish grassed lawns near streams or wetlands—leave a 15 to 30 ft buffer of natural vegetation.
Perennial ryegrass (turf)	45 to 60 lbs	2 lb	5.6 to 7.0	
+ bluegrass	79 to 90 lbs	2.5 lb		
Tall fescue (turf type)	130 to 170 lbs	4 lb	5.6 to 7.5	
+ bluegrass	20 to 30 lbs	1 lb		
Channels and other areas of concentrated water flows				
Perennial ryegrass	100 to 150 lbs	3 lb	5.6 to 7.0	Seed ditches and channels thickly. Do not use fertilizer near ditch or channel bottom. Use erosion control blankets or turf reinforcement mats when channel bottom slopes exceed 3%.
+ white or ladino clover	1 to 2 lbs	2 oz		
Kentucky bluegrass	20 lbs	0.5 lb	5.5 to 7.5	
+ smooth bromegrass	10 lbs	.25 lb		
+ switchgrass	3 lbs	2 oz		
+ timothy	4 lbs	.25 lb		Silt check dams are needed when channel slopes exceed 5% or when channels begin downcutting (gullying) on the bottom. Do not use silt fencing or straw bales as silt check dams in channels with slopes greater than 3%; use rock or brush instead.
+ perennial ryegrass	10 lbs	.25 lb		
+ white or ladino clover	1 to 2 lbs	2 oz		
Tall fescue	100 to 150 lbs	3 lb	5.5 to 7.5	
+ ladino or white clover	1 to 2 lbs	2 oz		
Tall fescue	100 to 150 lbs	3 lb	5.5 to 7.5	
+ perennial ryegrass	15 to 20 lbs	0.5 lb		
+ Kentucky bluegrass	15 to 20 lbs	0.5 lb		

Inspection and Maintenance

Water the soil until the grass is firmly established. This is especially needed when seedings are made late in the planting season, in abnormally dry and hot season, or on sites with steep slopes or other adverse conditions.

Inspect all seeded areas for failures and make necessary repairs, replacements, reseedings, and remulching within the planting season.

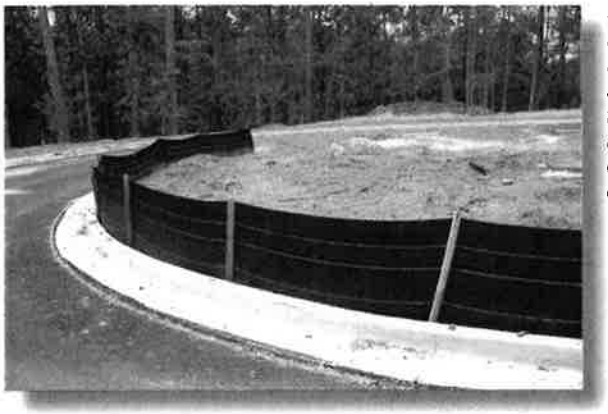
If stand is inadequate, (less than 85 percent groundcover) seed over the site and fertilize, using half of the seeding rate originally applied, and apply mulch.

If stand is more than 60 percent damaged, reestablish the stand. Follow the original seedbed preparation methods, seeding and mulching recommendations, and apply lime and fertilizer as needed according to a soil test.

Hydraulically applied seed, mulch, tackifier, and soil amendments (e.g., lime, fertilizer) offer excellent results at a reasonable price on large sites, especially those with long, steep slopes. Follow manufacturer's recommendation regarding materials mixing and application rates.

Seed ditches immediately after construction. Use mulch, netting, or erosion control blankets to protect newly seeded areas.

4.5.1 Silt Fence



Silt fencing is commonly used to pond, settle, and filter sediment from sheet runoff. Install at proper spacing on slopes; set back from slope toe to allow for maintenance. Make sure fencing is trenched in properly and stakes are on the downhill side. Inspect frequently to detect and address bypasses, undercutting, and overtopping.

SF

Definition

A silt fence is a temporary sediment barrier consisting of filter fabric entrenched into the soil and attached to supporting posts. Silt fences are downhill from bare soil areas and are installed with a trencher or by a slicing machine to prevent against common silt fence failures.

Purpose

Silt fences are common sediment control devices. Silt fencing should be installed where sediment-laden water can pond, thus allowing the sediment to fall out of suspension and separate from the runoff. Runoff will also *bleed through* the silt fence fabric, providing physical filtering for larger sediment particles. Reasons for the high failure rate of improperly designed (located) and installed silt fence include

- Improper placement (i.e., not on the contour, ends not turned up)
- Allowing excessive drainage area to the silt fence structure
- Shallow trenches with little or no soil compaction
- Inadequate attachment to posts
- Failure to maintain the silt fence after installation
- Installing silt fence along property boundaries, producing *concentrated* runoff

Design Criteria

Silt fencing must be installed only where water can pond. Specify silt fencing downgradient from bare soil areas, installed on the contour if possible, with the ends turned up to prevent bypassing. Provide adequate setbacks from slope toe for routine maintenance and access. Silt fencing can be used where

- Non-concentrated sheet flow will occur
- Protection of adjacent property or nearby surface waters is required
- The size of the drainage area is no more than 1/4 acre per 100 linear feet of silt fence
- The maximum flow path length above the barrier is 100 feet for slopes less than 2 percent, and 50 feet for slopes up to 10 percent

- The maximum slope gradient above the barrier is 2H:1V
- Silt fencing can be used in flat, short swales (i.e., slope is less than 2 percent; length is less than 200 feet) that drain less than 2 acres, if silt fencing is spaced every 50 feet.
- Reinforced silt fence must be required when the contributing slope is longer than 100 feet and greater than 3 percent and the design life of the silt fence is greater than 6 months.

Silt Fence Spacing on Long Slopes

Land Slope	Max. Slope Distance
3% – 5%	100 ft.
5% – 10%	75 ft.
10% – 20%	50 ft.
20% – 50%	25 ft.

Silt fencing should not be used

- Around the perimeter of large construction sites, unless J-hooks are used. Long continuous runs of silt fence will divert and concentrate sediment-laden runoff and almost certainly result in failure. A good general rule is to drain no more than 1/3 acre of disturbed area into each discrete J-hook;
- In ditches, channels, or streams. Silt fences cannot handle the volumes generated by concentrated channel flows. When installed across a concentrated flow path, undercutting or *end cutting* of the fence often occurs, or the fence is pushed over by the force of the flow.

Construction Specifications

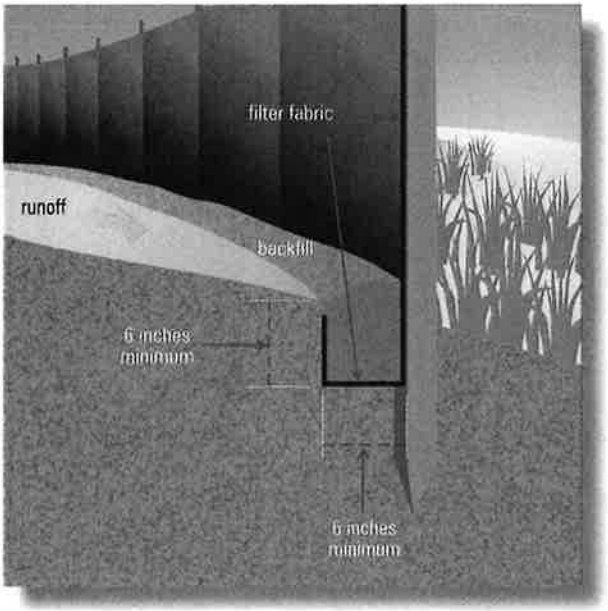
Silt fences have a useful life of one season. Their principal mode of action is to slow and pond the water and allow soil particles to settle with some minor filtration through the fabric. Silt fences are not designed to withstand high heads of water, and therefore should be located where only shallow pools (i.e., 1.5 feet or less) can form. Their use is limited to situations in which sheet or overland flows are expected.

- Dig a trench on the contour at least 6 inches wide and 6 inches deep below the area to be treated, taking care to install J-hooks where flows will travel along the silt fence. Turn fence ends uphill to trap potential bypasses as needed.
- If posts are already attached to fabric, position the fencing so the posts are installed on the downhill side of the fabric. Drive posts to a depth of 1 foot below the bottom of the trench, against downslope trench wall for extra support. Posts for all silt fencing are spaced 6 feet apart.
- Push fabric into the trench, and spread fabric along trench bottom and sides; backfill the trench and compact the soil. A preferred installation technique in deep, easily-worked soils with minimal rock content involves static slicing of the fence into the ground with a chisel-plow implement such as the *Tommy Silt Fence Machine* or equivalent. The filter fabric is wire-tied directly to the posts with three diagonal ties.
- The height of a silt fence must be 18 inches minimum and 30 inches maximum. Sediment storage height and ponding height must not exceed 18 inches.
- Silt fences placed at the toe of a slope must be set at least 6 feet back from the toe to increase ponding volume and provide room for maintenance.

Inspection and Maintenance

All sediment barriers should be placed downgradient from bare areas to be treated. The ends of the barrier should be turned uphill or otherwise configured to prevent end-around bypasses.

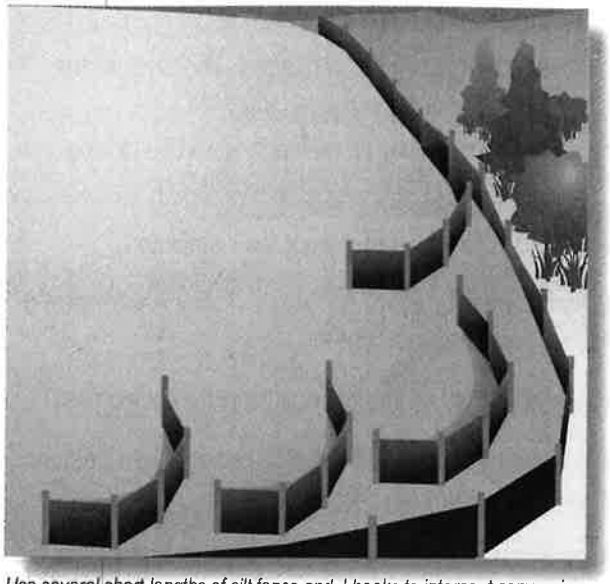
- Inspect fence for proper installation and compaction by pulling up on the fence while kicking the toe of the fabric. If the fence comes out of the ground, do not accept the installation.
- If there are long, linear runs of silt fence without J-hooks, do not accept the installation.
- Silt fences and filter barriers must be inspected weekly or every 14 days and after each storm of greater than one-half inch. Any required repairs must be made immediately.
- Sediment should be removed when it reaches 1/3 height of the fence or 18 inches maximum.
- The removed sediment must be spread and vegetated or otherwise stabilized so that it does not result in muddy runoff to nearby ditches or surface waters.
- Silt fences must be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized (e.g., vegetated) and any sediment stored behind the silt fence has been removed. Silt fences and other temporary controls must be removed before project close-out.



Make sure silt fence fabric is trenched in and is upslope of stakes. Leave room between the fencing and the upgradient slope for removing accumulated sediment.

Install silt fencing on the contour, with the ends turned uphill to trap muddy runoff and prevent bypasses. Remove silt fences when grass is established.

Do not use silt fencing in areas of concentrated flows. For best results, triple-seed ditches and line with erosion control blankets.



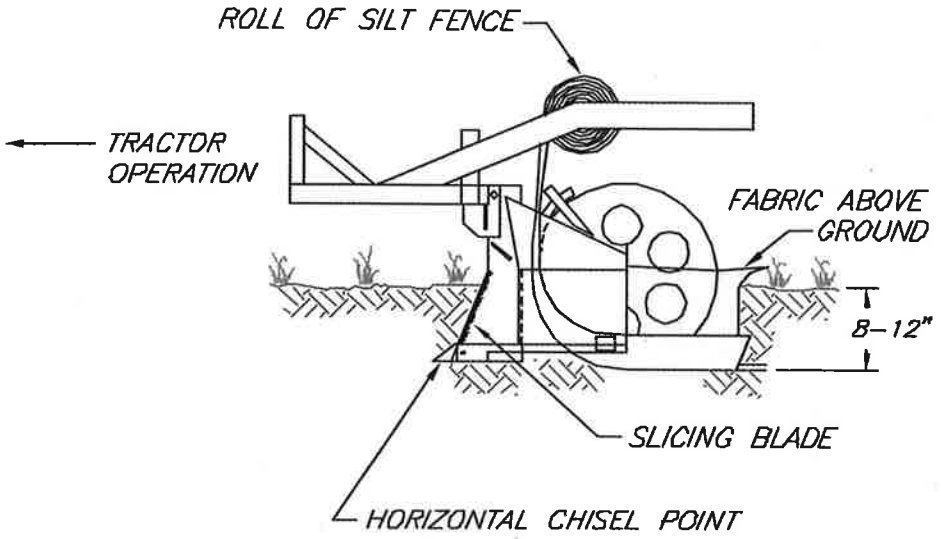
Use several short lengths of silt fence and J-hooks to intercept converging runoff in critical areas, such as property corners. This can help relieve stress and prevent failure at the corners.

Silt fence installed backwards—note that stakes are on the uphill, rather than downhill, side of the fabric. Ponding flows against this fence will push the fabric away from the stakes, causing failure and releasing sediment to the small stream on the right.

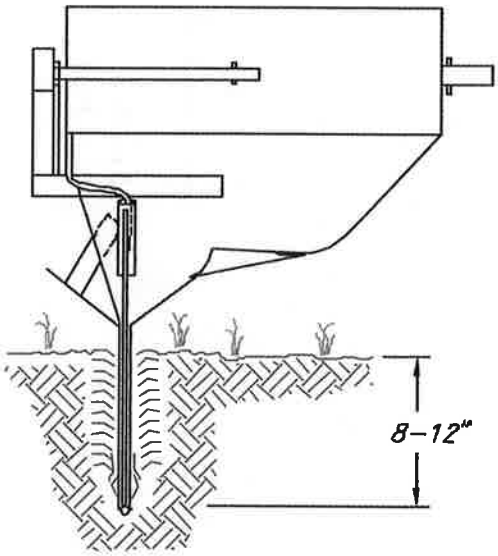
Use multiple silt fences at proper spacing (see table) to protect long, unvegetated slopes. Fences provide only temporary protection and can be removed when the area is seeded and mulched.

Silt fence is functioning well, but needs maintenance. Set fences back from the toe of the slope, to allow room for sediment to accumulate and maintenance.

Good installation of "super" (i.e., wire reinforced) silt fence. Note that wire is installed between the fabric and stakes, and provides a web of support as the ponded flow pushes against the fabric. Also, note the grass strip between the bare area and the fence, which helps to slow and filter flows before ponding along the fence line.



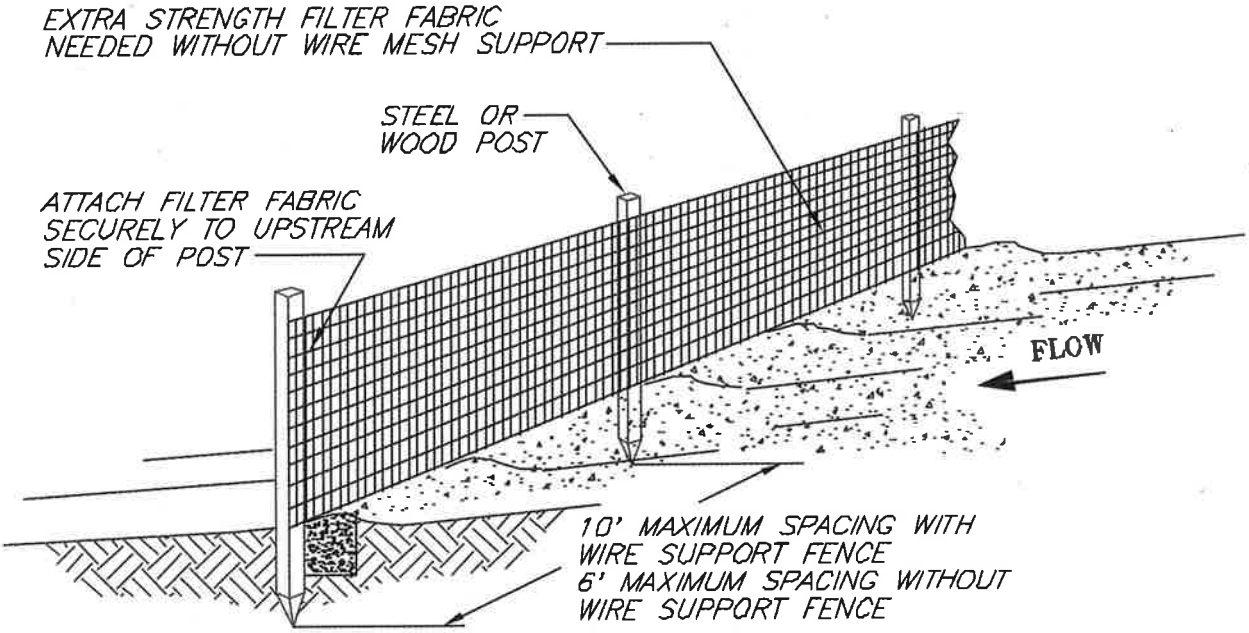
STATIC SLICING METHOD
SIDE VIEW

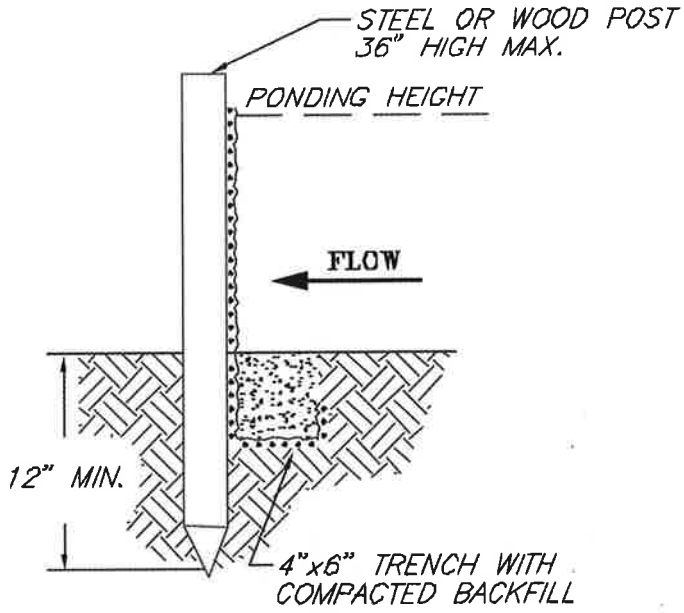


STATIC SLICING METHOD
BACK VIEW

SILT FENCE INSTALLATION: SLICING METHOD

SOURCE: SALIX APPLIED EARTHCARE – EROSION DRAW 5.0





TRENCH DETAIL

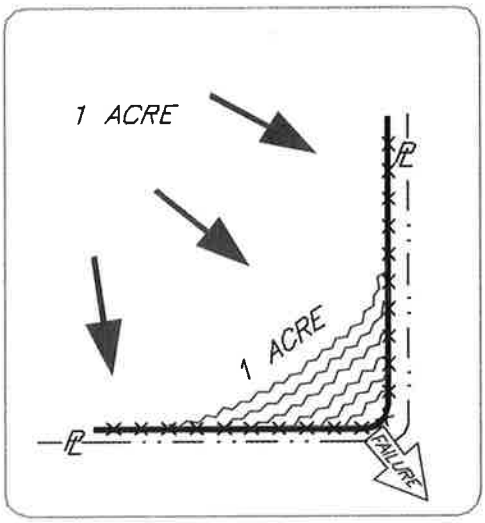
NOTES:

1. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.
2. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY. 9" MAXIMUM RECOMMENDED STORAGE HEIGHT.
3. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.

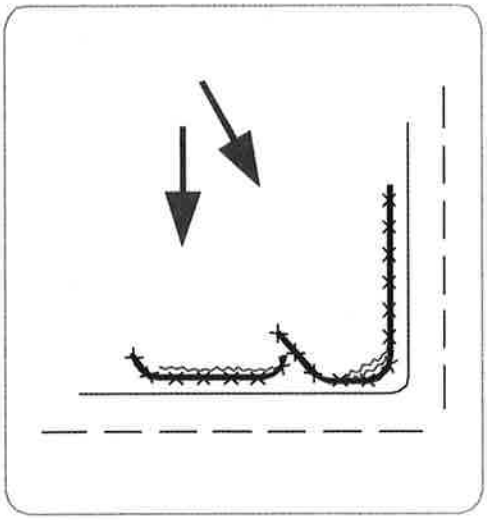
SOURCE: SALIX APPLIED EARTHCARE – EROSION DRAW 5.0

NOT TO SCALE

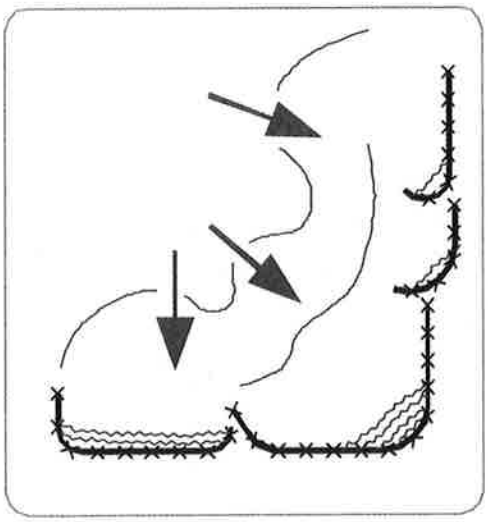
SILT FENCE INSTALLATION: TRENCH METHOD

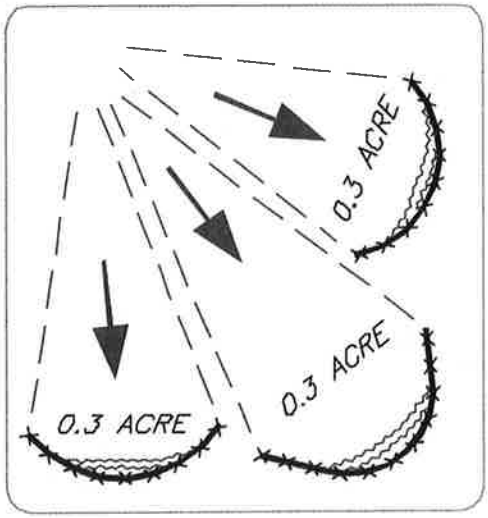


Incorrect – Do Not layout "perimeter control" silt fences along property lines. All sediment laden runoff will concentrate and overwhelm the system.



Correct – Install J-hooks

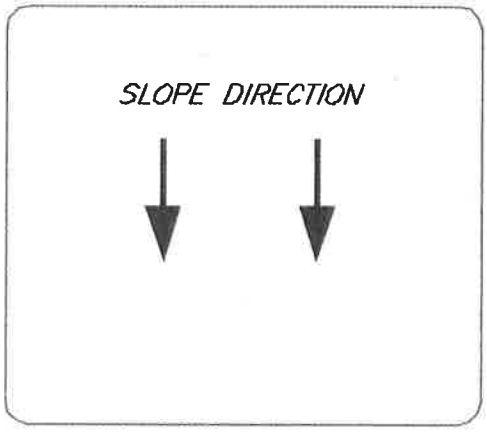


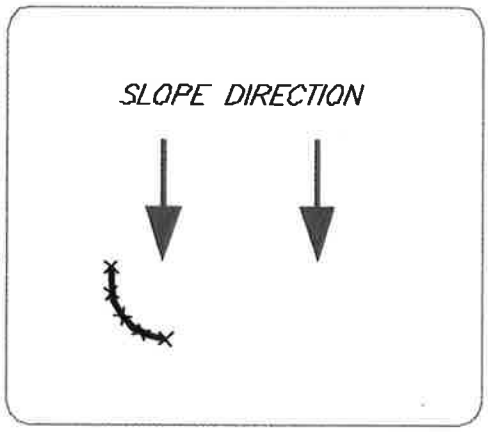


Discreet segments of silt fence, installed with J-hooks will be much more effective.

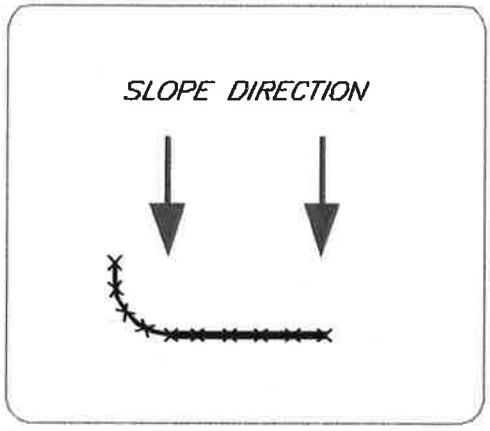
SOURCE: SALIX APPLIED EARTHCARE – EROSION DRAW 5.0

SILT FENCE PLACEMENT FOR PERIMETER CONTROL

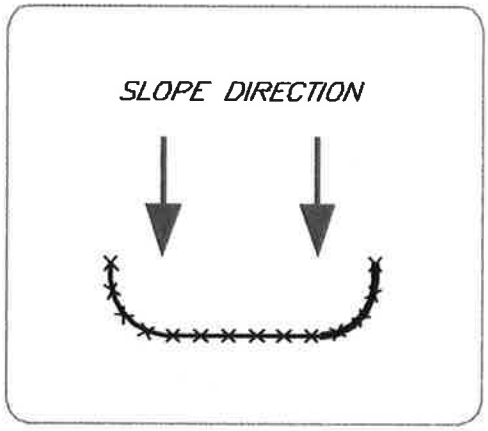




STEP 1 – CONSTRUCT LEG



STEP 2 – CONSTRUCT DAM

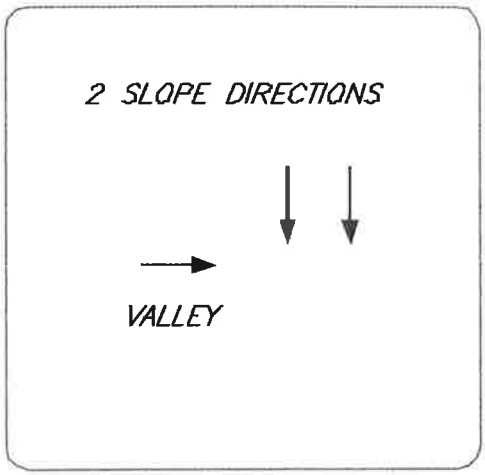


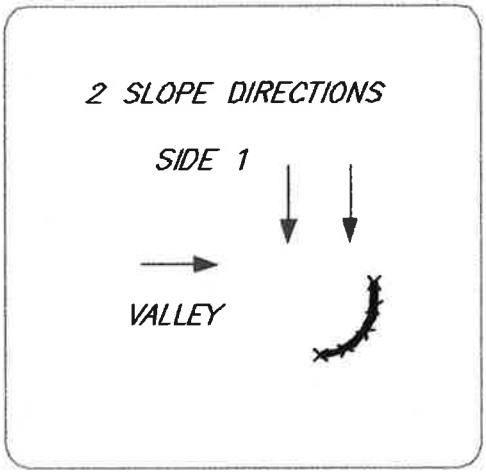
STEP 3 – CONSTRUCT LEG 2

INSTALLATION WITH J-HOOKS INCREASE SILT FENCE EFFICIENCY.

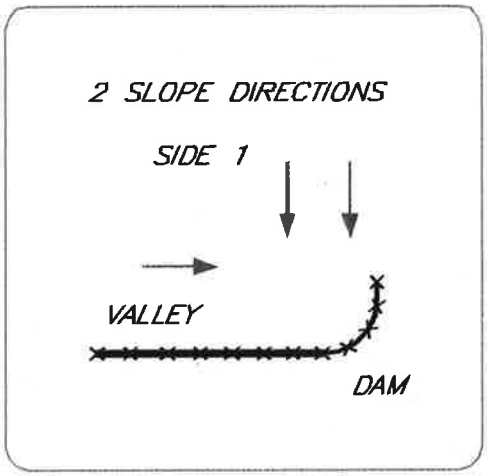
SILT FENCE: TYPICAL PLACEMENT ON SLOPE

SOURCE: SALIX APPLIED EARTHCARE – EROSION DRAW 5.0

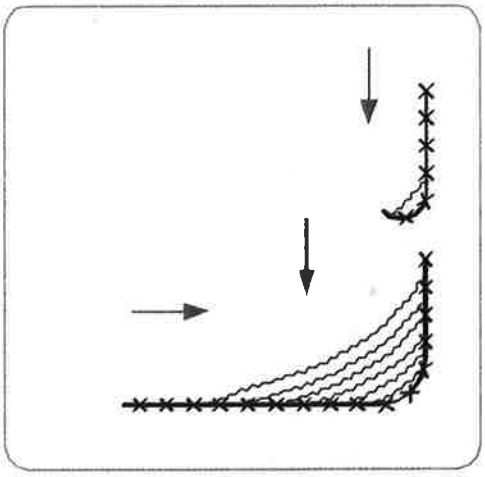




STEP 1 – CONSTRUCT A DAM



STEP 2 – CONSTRUCT SIDE 2



STEP 3 – CONSTRUCT J–HOOKS AS NEEDED

INSTALLATION WITH J–HOOKS WILL INCREASE SILT FENCE EFFICIENCY AND REDUCE EROSION–CAUSING FAILURES.

SOURCE: SALIX APPLIED EARTHCARE – EROSION DRAW 5.0

SILT FENCE: TYPICAL PLACEMENT TWO SLOPES

4.9.6 Concrete Waste Management

Concrete washout structures or areas should be designated and used to prevent discharge of highly alkaline wash water to the storm sewer or surface streams. Use bermed areas created with hay bales, earthen dikes, or other material—do not dispose of concrete wastes in excavated holes in areas with high groundwater tables. The best place to discharge excess concrete and concrete wash water is into formed-up areas that have been prepared for the next pour. Make sure no material flows out of the concrete forms.

Definition

Concrete waste management is a set of policies and procedures that address the handling and disposal of (1) excess fresh concrete mix, including truck and equipment washing, and (2) concrete dust and concrete debris resulting from demolition.

Purpose

Concrete waste and wash water from trucks are present at most construction sites. Both forms of concrete waste have the potential to impact water quality through stormwater runoff contact with the waste. The purpose of good housekeeping practices associated with managing these wastes is to prevent stormwater contamination and impacts to receiving waters downstream.

Implementation

A number of water quality parameters can be affected by introduction of concrete, especially fresh concrete. Concrete contains hexavalent chromium and affects the pH of runoff, causing significant chemical changes in water bodies and harming aquatic life. Suspended solids in the form of both cement and aggregate dust are also generated from both fresh and demolished concrete waste.

Unacceptable Concrete and Wash Water Disposal Practices

- Dumping in unmanaged vacant areas on the job site.
- Illicit dumping away from the job site.
- Dumping into ditches, storm drains, or drainage facilities.
- Dumping wash water from trucks and chutes into storm drains

Recommended Disposal Practices

- Prevent runoff of wash water and concrete waste into storm drains, ditches, and waterways.
- If possible, dump waste and wash water into areas prepared for new concrete pouring.
- If no future pour site is available, develop other safe concrete disposal areas.
- Provide a washout area with a minimum of 6 cubic feet of containment area volume for every 10 cubic yards of concrete poured.
- Never dump waste concrete illicitly or without the property owner's knowledge and consent.
- Wash water must be handled in a manner that does not result in a violation of groundwater or surface water quality standards.

Education

- Drivers and equipment operators should be instructed on proper disposal and equipment washing practices (see above).
- Supervisors must be made aware of the potential environmental consequences of improperly handled concrete waste.

Enforcement

- The construction site manager or foreman must ensure that employees and pre-mix companies follow proper procedures for concrete disposal and equipment washing.
- Employees violating disposal or equipment cleaning directives must be reeducated or disciplined if necessary.

Demolition Practices

- Monitor weather and wind direction to ensure that concrete dust is not entering drainage structures and surface waters.
- Where appropriate, construct sediment traps or other types of sediment detention devices downstream of demolition activities.

Performance Indicators

- Use predetermined disposal sites for waste concrete.
- Prohibit dumping waste concrete anywhere but predetermined areas.
- Assign predetermined truck and equipment washing areas.
- Educate drivers and operators on proper disposal and equipment cleaning procedures.

This is a commercial concrete washout tank with fold-up ramp.

Shown here is a straw bale and plastic concrete washout structure. Place concrete washouts in convenient locations, make sure mixing truck drivers know where they are, and make sure they use them.

FREEMAN LAKE PARK - SHELTERS PROJECT

FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY 42701

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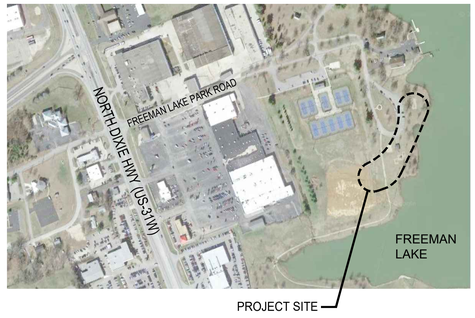
O 270.766.1112

ECS SOUTHEAST, LLP
Geotechnical Engineer
1762 Watterson Trail, Louisville, KY 40299
O 502.493.7100

VICINITY MAP



DEFERRED SUBMITTALS

KBC 106.3.4.2: DEFERRED SUBMITTALS

THE FOLLOWING IS A LIST OF DEFERRED SUBMITTALS. DEFERRED SUBMITTALS ARE THOSE PORTIONS OF THE DESIGN WHICH HAVE NOT BEEN SUBMITTED AT THE TIME THE CONSTRUCTION DOCUMENTS WERE SUBMITTED TO THE AUTHORITY HAVING JURISDICTION (AHJ) TO OBTAIN THEIR AUTHORIZATION TO PROCEED WITH CONSTRUCTION. DEFERRED SUBMITTALS CONSIST OF THOSE PORTIONS OF WORK WHICH ARE THE RESPONSIBILITY OF THE CONTRACTOR AND INCLUDE:

1. WOOD TRUSSES

THE WORK OF THE DEFERRED SUBMITTAL SHALL NOT BE INSTALLED UNTIL DEFERRED SUBMITTAL DESIGN AND SUBMITTAL DOCUMENTS HAVE BEEN APPROVED BY THE AHJ. THE CONTRACTOR IS RESPONSIBLE FOR PROCURING AND PROVIDING EACH DEFERRED SUBMITTAL, SUBMITTING THEM TO THE ARCHITECT/ENGINEER, AND ONCE REVIEWED BY AND RETURNED FROM THE ARCHITECT/ENGINEER, SUBMITTING THE DEFERRED SUBMITTALS TO THE AHJ FOR THEIR FINAL REVIEW AND APPROVAL.

GENERAL NOTES

- THE WORK FOR THIS PROJECT SHALL BE IN CONFORMANCE TO THE SPECIFICATIONS.
- ALL NECESSARY INSPECTIONS AND/OR CERTIFICATIONS REQUIRED BY CODES AND/OR UTILITY SERVICE COMPANIES SHALL BE PERFORMED PRIOR TO THE FINAL CONNECTION OF SERVICES.
- THE CONTRACTOR SHALL CONFINE ALL CONSTRUCTION ACTIVITY TO THE AREA WITHIN THE EXISTING EASEMENTS AND CONSTRUCTION LIMITS, UNLESS OTHERWISE APPROVED BY THE OWNER.
- THE CONTRACTOR SHALL CONFORM TO ALL LOCAL, STATE AND FEDERAL CODES AND RECEIVE APPROVAL WHERE NECESSARY PRIOR TO COMMENCEMENT OF WORK.
- THE ENGINEER RESERVES THE RIGHT TO MAKE MINOR FIELD ADJUSTMENTS IN THE WORK IN ORDER TO ACCOMPLISH THE INTENT OF THE DESIGN.
- CONTACT KY 811 (BUD) AT LEAST 72 HOURS BEFORE ANY EXCAVATION IS UNDERTAKEN.

INDEX OF DRAWINGS

OWNER INFORMATION

City of Elizabethtown City Council
200 West Dixie Avenue, Elizabethtown, KY 42701
Phone: 270.765.6121

Jeff Gregory
Mayor

Tony Bishop
City Council Member

Marty Fulkerson
City Council Member

Julia Springsteen
City Council Member

Cindy Walker
City Council Member

Virgil Willoughby
City Council Member

Bill Wiseman
City Council Member

FAILURE TO ABIDE BY DESIGN DOCUMENTS OR TO OBTAIN GUIDANCE:

THE DESIGN PROFESSIONAL WAIVES ANY AND ALL RESPONSIBILITY AND LIABILITY FOR PROBLEMS WHICH ARISE FROM FAILURE TO FOLLOW THESE PLANS, SPECIFICATIONS AND THE DESIGN INTENT THEY CONVEY, OR FOR OTHERS' FAILURE TO OBTAIN AND/OR FOLLOW THE DESIGN PROFESSIONAL'S GUIDANCE WITH RESPECT TO ANY ERRORS, OMISSIONS, INCONSISTENCIES, AMBIGUITIES OR CONFLICTS WHICH ARE ALLEGED.

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The Shape Of Ideas

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COVER SHEET

FREEMAN LAKE PARK - SHELTERS PROJECT
FREEMAN LAKE PARK ROAD
Elizabethtown, KY

CONSTRUCTION DOCUMENTS

Project Number
21049.05

Issue Date:
DECEMBER 22, 2023

BILL PICKERING REGISTERED No. 25495 PROFESSIONAL ENGINEER COMMONWEALTH OF KENTUCKY ARCHITECT
21 DECEMBER 2023

CVR

STRUCTURAL NOTES:

GENERAL NOTES:

1. TYPICAL NOTES & DETAILS ARE PROVIDED TO COVER GENERAL CONSTRUCTION CONDITIONS. THE CONTRACTOR SHALL FOLLOW THOSE DETAILS & NOTES PERTAINING TO THE SPECIFIC NATURE OF THE WORK TO BE PERFORMED.
2. NOTES & DETAILS ON THESE STRUCTURAL DRAWINGS SHALL APPLY UNLESS SPECIFICALLY SHOWN OR NOTED OTHERWISE. DETAILS ARE SHOWN IN DIAGRAMATIC FORM AND ARE NOT TO BE SCALED (SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS, ELEVATIONS, SLOPES, FINISHES, ETC.). CONSTRUCTION DETAILS NOT SHOWN OR NOTED SHALL BE SIMILAR TO DETAILS SHOWN FOR SIMILAR CONDITIONS. ALL WORK OR CONSTRUCTION SHALL COMPLY WITH THE CURRENT BUILDING CODE AND ALL OTHER APPLICABLE REGULATIONS & SAFETY REQUIREMENTS.
3. THE SPECIFICATIONS ARE INTENDED TO AUGMENT THE STRUCTURAL DRAWINGS AND ARE AN INTEGRAL PART OF THE CONSTRUCTION DOCUMENTS. SHOULD THE DRAWINGS DIFFER FROM THE SPECIFICATIONS, NOTIFY THE ENGINEER FOR CLARIFICATION.
4. DISCREPANCIES – IN THE EVENT OF A DISCREPANCY IN THE STRUCTURAL CONSTRUCTION DOCUMENTS, THE NOTE OR DETAIL UTILIZING THE STRICTER REQUIREMENT SHALL APPLY.
5. EXCAVATION, SHORING, & BRACING – IT SHALL BE THE CONTRACTOR'S SOLE RESPONSIBILITY TO DESIGN AND PROVIDE ADEQUATE SHORING, BRACING, FORM WORK, ETC., AS REQUIRED FOR PROTECTION OF LIFE & PROPERTY, TO SUPPORT ANY CONSTRUCTION LOADS, AND TO MAINTAIN ALL BUILDING COMPONENTS SAFELY IN PLACE PRIOR TO THEIR FINAL ASSEMBLY AND ANCHORAGE INTO THE COMPLETED STRUCTURE.
6. ICON SHALL NOT BE RESPONSIBLE IN ANY WAY FOR CONSTRUCTION MEANS ,METHODS, SEQUENCES, OR PROCEDURES SINCE THESE ARE THE CONTRACTORS SOLE RESPONSIBILITY UNDER THE CONTRACT.
7. INSPECTIONS – ALL INSPECTION AND TESTING SHALL BE PERFORMED ACCORDING TO BUILDING CODE AND/OR MORE STRINGENT REQUIREMENTS OF THESE PLANS.
8. COORDINATION – REFER TO THE MECHANICAL, ELECTRICAL, PLUMBING, AND ALL OTHER PERTINENT DRAWINGS FOR THE SIZE AND LOCATION OF PIPE, VENT, DUCT, AND OTHER OPENINGS & DETAILS NOT SHOWN ON THESE STRUCTURAL DRAWINGS. ALL DIMENSIONS SHALL BE CHECKED & COORDINATED BY THE CONTRACTOR.

DESIGN CRITERIA:

BUILDING CODE:
2018 KENTUCKY BUILDING CODE AND 2015 INTERNATIONAL BUILDING CODE (IBC)
SEE S–002 FOR STORM SHELTER SPECIFIC DESIGN CRITERIA.

DEAD LOADS:
TRUSSES
- TOP CHORD 10PSF
- BOTTOM CHORD 10PSF

LIVE LOADS:
ROOFS 20 PSF

SNOW LOAD:
GROUND SNOW LOAD (P g) 15 PSF
SNOW EXPOSURE FACTOR (C_e) 1.0
THERMAL FACTOR (C t) 1.0
SNOW LOAD IMPORTANCE FACTOR (I s) 1.1
FLAT ROOF SNOW LOAD, Pf = 0.7 $C_e C_t I_s P_g$ 11.6 PSF

WIND LOAD:
ULTIMATE DESIGN WIND SPEED 120 MPH
RICK CATEGORY II
EXPOSURE CATEGORY C
INTERNAL PRESSURE COEFFICIENT (GCpi) ±0.18
COMPONENTS AND CLADDING WIND PRESSURE ±23PSF

SEISMIC LOAD:
RISK CATEGORY II
SEISMIC IMPORTANCE FACTOR (I_E) 1.0
MAPPED SPECTRAL RESPONSE ACCELERATION PARAMETERS:
- Ss 0.20
- S_1 0.106

SITE CLASS D
DESIGN SPECTRAL ACCELERATION PARAMETERS:
- SDs 0.213
- SD1 0.169

SEISMIC DESIGN CATEGORY C
BASIC SEISMIC – FORCE – RESISTING SYSTEM: ORDINARY REINFORCED MASONRY SHEAR WALLS
RESPONSE MODIFICATIONS COEFFICIENT (R): 3
ANALYSIS PROCEDURE: EQUIVALENT LATERAL FORCE

SHOP DRAWINGS:

SHOP DRAWINGS ARE AN AID FOR FIELD PLACEMENT AND ARE SUPERSEDED BY THE STRUCTURAL DRAWINGS. ANY REVIEW OF SHOP DRAWINGS BY THIS OFFICE IS ONLY FOR GENERAL CONFORMANCE TO THE STRUCTURAL REQUIREMENTS AND IN NO WAY GUARANTEES THE ACCURACY OR COMPLETENESS OF INFORMATION THEREON. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO INSURE ALL CONSTRUCTION IS IN FULL COMPLIANCE WITH THE LATEST SET OF STRUCTURAL DRAWINGS. SHOP DRAWINGS PREPARED BY SUPPLIERS, SUBCONTRACTORS, ETC. SHALL BE REVIEWED AND COORDINATED BY THE CONTRACTOR, PRIOR TO SUBMITTING TO THE ENGINEER. SHOP DRAWINGS MAY NOT BE BASED ON CONTRACT DRAWINGS. ALL SHOP DRAWINGS WHICH HAVE NOT BEEN PREPARED FROM SCRATCH WILL BE REJECTED. SUBMIT ELECTRONIC COPY FOR REVIEW. REVIEW SET WILL BE RETURNED WITH ANY COMMENTS ELECTRONICALLY IN PDF FORM.

FOUNDATION NOTES:

1. SPREAD AND STRIP FOOTINGS HAVE BEEN DESIGNED FOR AN ASSUMED SOIL BEARING PRESSURE OF 2,000 PSF AT 30 INCHES BELOW GRADE.
2. FOOTINGS SHALL BE CENTERED UNDER COLUMNS AND WALLS UNLESS SPECIFICALLY DETAILED OTHERWISE ON THE DRAWINGS.
3. PROTECT EXISTING UTILITIES AND STRUCTURES, OVERHEAD OR UNDERGROUND, IN WORK AREA.
4. FOOTINGS SHALL BE STEPPED/DROPPED AT UNDERGROUND PIPING AS REQUIRED. COORDINATE WITH PLUMBING WORK FOR REQUIRED STEP/DROP LOCATIONS.
6. FOOTINGS SHALL NOT BE PLACED ONTO OR AGAINST SUBGRADES CONTAINING FREE WATER, FROST OR ICE. CONTRACTOR SHALL FURNISH ALL REQUIRED DEWATERING EQUIPMENT TO MAINTAIN A DRY EXCAVATION UNTIL BACKFILL IS COMPLETE.

CONCRETE NOTES:

1. CONCRETE STRENGTH – PROVIDE CONCRETE WITH THE FOLLOWING STRENGTHS AT THE LOCATIONS NOTED. MIX DESIGN, SLUMP, AIR ENTRAINMENT, AGGREGATE SIZE, ETC., SHALL BE IN CONFORMANCE WITH THE A.C.I. CODE, LATEST EDITION.

LOCATION	STRENGTH (PSI @ 28 DAYS)
SPREAD FOOTINGS AND FOUNDATIONS, SLAB ON GRADE,	4,000 PSI NORMAL WEIGHT

2. REINFORCING STEEL – ASTM A615 GRADE 60 (UNLESS WELDED).
3. WELDING OF REINFORCING STEEL SHALL CONFORM TO AWS D12–1 USING PROPER LOW HYDROGEN ELECTRODES. ALL BARS TO BE WELDED SHALL CONFORM TO ASTM A706.
4. FABRICATE AND PLACE REINFORCEMENT IN ACCORDANCE WITH ACI PUBLICATION SP–66, ACI DETAILING MANUAL – LATEST EDITION.
5. ALL CONCRETE WORK SHALL CONFORM TO THE LATEST EDITION OF THE AMERICAN CONCRETE INSTITUTE PUBLICATIONS: ACI 301, ACI 311, ACI 315, ACI 318, ACI 347, ACI 304. ALL CONCRETE SHALL BE MECHANICALLY VIBRATED.
6. CONCRETE COVER FOR REINFORCEMENT FOR NON–PRESTRESSED, CAST IN PLACE CONCRETE SHALL BE AS FOLLOWS:

CONDITION	COVER
CAST AGAINST EARTH	3"
EXPOSED TO WEATHER	
#5 & SMALLER	1 1/2"
#6 & LARGER	2"
SLAB–ON–GRADE	2"

7. EMBEDS – ALL ITEMS TO BE CAST INTO CONCRETE SUCH AS REINFORCING DOWELS, BOLTS, ANCHORS, PIPES, SLEEVES, ETC., SHALL BE SECURELY AND ACCURATELY POSITIONED INTO THE FORMS PRIOR TO PLACING THE CONCRETE.
8. CONSTRUCTION JOINTS – THE CONTRACTOR SHALL OBTAIN THE ENGINEER'S APPROVAL FOR CONCRETE CONSTRUCTION JOINT LOCATIONS. REINFORCING STEEL DETAILING MAY CHANGE AND THE CONTRACTOR MAY BE RESPONSIBLE FOR ADDITIONAL EXPENSES AS A RESULT.
9. ALL FIELD BENDING OF REINFORCING SHALL BE DONE COLD. HEATING OF BARS WILL NOT BE PERMITTED.
10. THE CONTRACTOR SHALL PREPARE AND SUBMIT REINFORCEMENT SHOP DRAWINGS TO THE ENGINEER FOR REVIEW PRIOR TO FABRICATION. THE SHOP DRAWINGS SHALL CLEARLY SHOW ALL REINFORCEMENT LENGTHS AND BENDS, LOCATIONS OF ALL BARS, METHODS OF SUPPORT, DETAILS OF PLACEMENT AND PLACEMENT COORDINATION WITH FORM–WORK, EMBEDMENTS, CONCRETE VIBRATION AND CONSTRUCTION JOINTS.

CONCRETE MASONRY GENERAL NOTES:

1. PROVIDE VERTICAL REINFORCEMENT AS FOLLOWS:
   8" CMU WALLS #5 @ 32" O.C.
   PROVIDE 2) #5 VERTICAL REINFORCEMENT AT JAMBS OF EACH OPENING, AT BOTH SIDES OF CONTROL JOINT; AND AT EACH END OR CORNER OF WALL, UNLESS SHOWN OTHERWISE.
2. PROVIDE HORIZONTAL REINFORCEMENT AS FOLLOWS:
   BOND BEAMS: BOND BEAM REINFORCING TO BE 2) #5 REBAR AT SPACING NOT TO EXCEED 8 FT
   PROVIDE ADDITIONAL BOND BEAMS AT TOP & BOTTOM OF DOOR OPENINGS.
   ALL CMU WALLS: LADDER TYPE W1.7 (9 GA.) GALVANIZED WELDED WIRE JOINT REINF. @ 16" O.C.
   PROVIDE 90° HOOKS FOR ALL BOND BEAM REINFORCING BARS AT CORNERS.
3. GROUT ALL BELOW GRADE CORES SOLID.
4. CONSTRUCT MASONRY IN RUNNING BOND ONLY, UNLESS NOTED OTHERWISE.
5. PROVIDE VERTICAL CONTROL JOINTS WHERE SHOWN. IF NOT SHOWN, PROVIDE CONTROL JOINTS AT SPACING NOT TO EXCEED 40 FT., SO AS NOT TO REDUCE THE OVERALL STRENGTH AND STABILITY OF THE WALL. SUBMIT DRAWINGS INDICATING LOCATIONS AND CONSTRUCTION OF JOINTS FOR ARCHITECT'S REVIEW.
6. THE MASONRY WORK HAS BEEN DESIGNED AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE "BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES" (ACI 530/ASCE 5/TMS 402).
7. ALL CMU SHALL BE LIGHTWEIGHT, CONFORMING TO ASTM C90, GRADE N, WITH MINIMUM AVERAGE NET AREA COMPRESSIVE STRENGTH OF 3,250 PSI (f' m=2,500 PSI) BUT NOT LESS THAN, UNLESS NOTED OTHERWISE. SEE S–002 FOR STORM SHELTER WALL REQUIREMENTS.
8. USE TYPE OF MORTAR IN CONJUNCTION WITH THE TYPE OF CMU TO PRODUCE REQUIRED MASONRY COMPRESSIVE STRENGTH, AND CONFORMING TO ASTM C270.
9. THE REINFORCEMENT SHALL CONFORM TO THE LATEST EDITION OF THE FOLLOWING SPECIFICATIONS:
   REBAR ASTM A615 GRADE 60
   GALVANIZED CARBON STEEL WIRE ASTM A82
10. GROUT REINFORCED MASONRY WITH LOW RISE METHOD ONLY. GROUT SHALL CONFORM TO ASTM C476 AND SHALL HAVE MINIMUM COMPRESSIVE STRENGTH OF 2500 PSI @ 28 DAYS. LIFTS OF GROUT SHALL BE KEYED 2 INCHES INTO THE PREVIOUS COURSE OF MASONRY BELOW.
    MORTAR SHALL NOT BE USED IN PLACE OF GROUT
11. POURABLE CONSISTENCY GROUT SHALL BE USED TO FILL ANY REQUIRED CAVITIES AT BEAM, JOIST AND METAL DECK BEARING COURSES, AT VERTICAL FILL OF HOLLOW CELLS, BOND BEAMS, REINFORCED MASONRY BEAMS, PIERS AND COLUMNS. VERTICAL CELLS CONTAINING REINFORCING AND GROUT SHALL FORM A CONTINUOUS CAVITY, FREE OF MORTAR DROPPINGS.
12. WALLS SHALL BE STEPPED/DROPPED AT UNDERGROUND PIPING AS REQUIRED. COORDINATE WITH FOUNDATION AND PLUMBING WORK FOR REQUIRED STEP/DROP LOCATIONS.

HIGH STRENGTH NON-SHRINK GROUT NOTES:

NON–SHRINK GROUT SHALL BE NON–FERROUS, NON–SHRINK GROUT WITH A STRENGTH OF 10,000 PSI MINIMUM MANUFACTURED BY MASTER BUILDERS (NSGROUT), OR EQUAL. SURFACE OR EXISTING CONCRETE SHALL BE FREE FROM DUST, DEBRIS OR WATER PRIOR TO PLACING GROUT. GROUT PRODUCT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S WRITTEN RECOMMENDATIONS. GROUT MUST BE PLACED IMMEDIATELY AFTER COLUMN IS PLUMB, AND BEFORE ANY DECKING IS PLACED.

DELEGATED DESIGN OF BUILDING COMPONENTS:

1. DESIGN OF CERTAIN BUILDING COMPONENTS THAT ARE NOT CONSIDERED PART OF THE PRIMARY STRUCTURAL SYSTEM IS DELEGATED TO BE COMPLETED BY A SPECIALTY STRUCTURAL ENGINEER RETAINED BY THE CONTRACTOR. THESE COMPONENTS MAY INCLUDE BUT ARE NOT LIMITED TO, PREENGINEERED PAVILION STRUCTURE, PREENGINEERED TRUSSES, ARCHITECTURAL AND STRUCTURAL HEAVY TIMBER, AND HEAVY TIMBER DECKING. THE DESIGN SHALL INCLUDE THE CONNECTIONS TO THE PRIMARY BUILDING FRAME WHERE APPLICABLE.
2. THE SPECIALTY STRUCTURAL ENGINEER SHALL DESIGN THE COMPONENT(S) AND ASSOCIATED CONNECTIONS, FOR THE LOADS AND DEFLECTION REQUIREMENTS INDICATED. THE REVIEW OF THE SHOP DRAWING SUBMITTAL BY THE STRUCTURAL ENGINEER SHALL ONLY BE TO VERIFY COMPLIANCE WITH DESIGN INTENT, APPLICATION OF LOADS SPECIFIED, AND REVIEW OF THE PRIMARY BUILDING FRAME TO RESIST THE LOADS IMPOSED BY THE COMPONENT CONNECTIONS.

EPOXY NOTES:

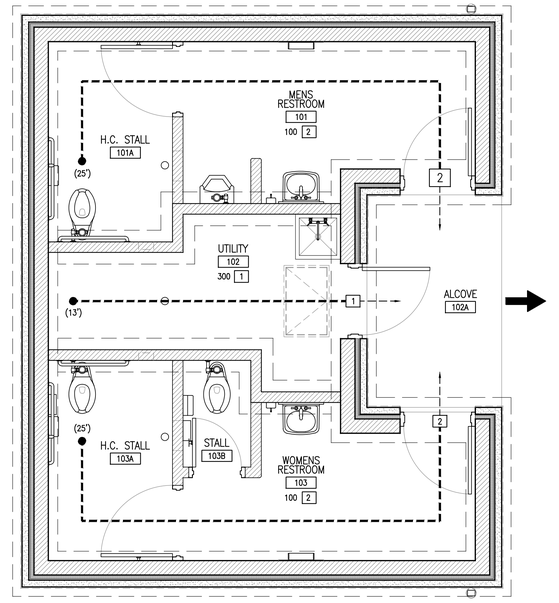
1. ALL REINFORCING DOWELS OR THREADED ROD DOWELS INDICATED IN THE CONSTRUCTION DOCUMENTS TO BE "SET INTO HOLES FILLED WITH EPOXY ADHESIVE" SHALL BE GOVERNED BY THE PROVISIONS THIS SECTION AS WELL AS THE SPECIFIC INSTALLATION PROVISIONS REQUIRED BY THE PRODUCT MANUFACTURER AND APPLICABLE I.C.B.O. EVALUATION REPORT REQUIREMENTS.
2. ACCEPTABLE PRODUCTS ARE AS FOLLOWS:
   THE GENERAL CONTRACTOR SHALL SUBMIT TO THE STRUCTURAL ENGINEER THE EPOXY PRODUCT NAME TO BE USED ALONG WITH IT'S I.C.B.O. REPORT & TESTING REQUIREMENTS.
   ADHESIVE ANCHORS FOR CONCRETE AND MASONRY AS PROVIDED BY SIMPSON STRONG–TIE
   CONTACT SIMPSON AT (800) 999–5099 FOR PRODUCT RELATED QUESTIONS.
   FOR ANCHORING IN TO CRACKED AND UNCRACKED CONCRETE
   A. ADHESIVE ANCHORS SHALL HAVE BEEN TESTED IN ACCORDANCE WITH ACI 355.4 AND/OR ICC–ES AC308 FOR CRACKED CONCRETE AND SEISMIC APPLICATIONS. ADHESIVE ANCHORS SHALL BE INSTALLED BY A CERTIFIED ADHESIVE ANCHOR INSTALLER WHERE DESIGNATED ON THE CONTRACT DOCUMENTS. PRE–APPROVED PRODUCTS INCLUDE:
      1. SIMPSON STRONG–TIE "SET–XP" (ICC–ES ESR–2508)
   FOR ANCHORING IN TO GROUT–FILLED CONCRETE MASONRY UNITS
   A. ADHESIVE ANCHORS SHALL HAVE BEEN TESTED IN ACCORDANCE WITH ICC–ES AC58. PRE–APPROVED PRODUCTS INCLUDE:
      1. SIMPSON STRONG–TIE "SET–XP" (APMQ–UES ER–265)
3. PROVIDE DRILLED HOLES OF DIAMETER AND DEPTH SPECIFIED BY THE PRODUCT MANUFACTURER FOR THE DOWEL SIZE SPECIFIED IN THE CONSTRUCTION DOCUMENTS OR THE DIAMETER AND DEPTH SPECIFIED IN THE CONTRACT DOCUMENTS, WHICHEVER IS GREATER WHEN DEPTH OF EMBEDMENT IS CONSIDERED.
4. INSTALL ANCHORS PER THE MANUFACTURER INSTRUCTIONS, AS INCLUDED IN THE ANCHOR PACKAGING.
5. THE CONTRACTOR SHALL ARRANGE AN ANCHOR MANUFACTURER'S REPRESENTATIVE TO PROVIDE ONSITE INSTALLATION TRAINING FOR ALL OF THEIR ANCHORING PRODUCTS SPECIFIED. THE STRUCTURAL ENGINEER OF RECORD MUST RECEIVE DOCUMENTED CONFIRMATION THAT ALL OF THE CONTRACTOR 'S PERSONNEL WHO INSTALL ANCHORS ARE TRAINED PRIOR TO THE COMMENCEMENT OF INSTALLING ANCHORS.
6. ANCHOR CAPACITY IS DEPENDANT UPON SPACING BETWEEN ADJACENT ANCHORS AND PROXIMITY OF ANCHORS TO EDGE OF CONCRETE. INSTALL ANCHORS IN ACCORDANCE WITH SPACING AND EDGE CLEARANCES INDICATED ON THE DRAWINGS.
7. EXISTING REINFORCING BARS IN THE CONCRETE STRUCTURE MAY CONFLICT WITH SPECIFIC ANCHOR LOCATIONS. UNLESS NOTED ON THE DRAWINGS THAT THE BARS CAN BE CUT, THE CONTRACTOR SHALL REVIEW THE EXISTING STRUCTURAL DRAWINGS AND SHALL UNDERTAKE TO LOCATE THE POSITION OF THE REINFORCING BARS AT THE LOCATIONS OF THE CONCRETE ANCHORS, BY HILTI FERROSCAN, GPR, X–RAY, OR OTHER MEANS.

WOOD TRUSS NOTES:

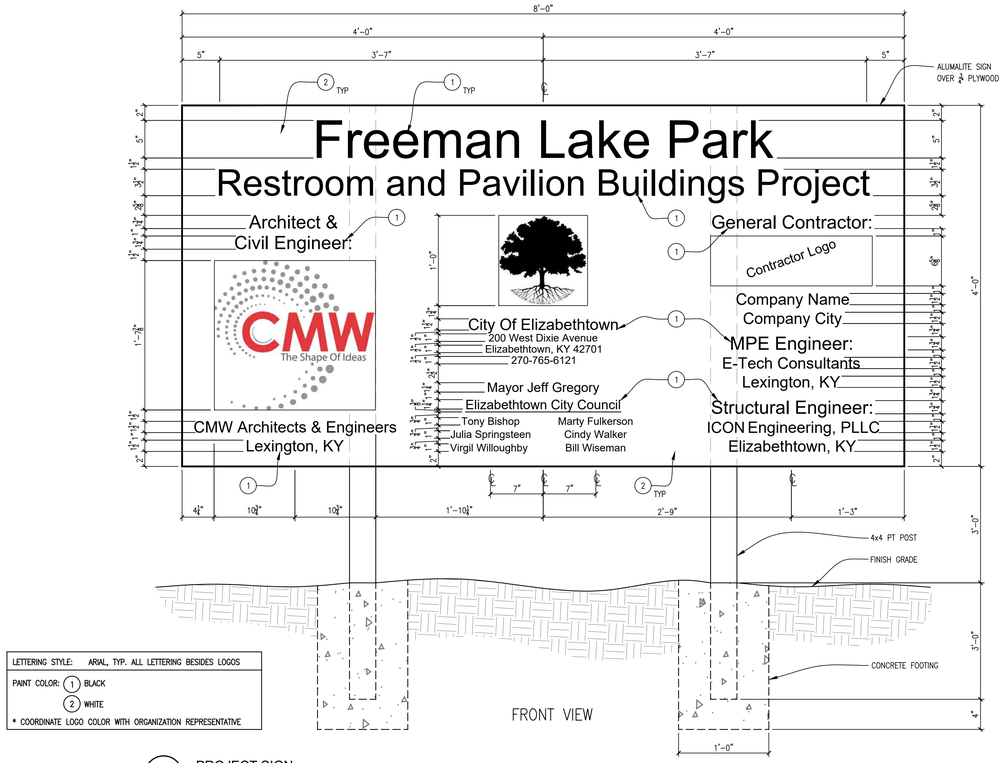
1. THE DESIGN OF THE ROOF TRUSS SYSTEM, BRACING, ETC. IS THE SOLE RESPONSIBILITY OF THE TRUSS MANUFACTURER USING THE BEARING LOCATIONS IDENTIFIED. ANY DEVIATION FROM THE BEARING LOCATIONS SHOWN SHALL BE APPROVED BY THE EOR PRIOR TO SUBMITTAL OF THE SHOP DRAWINGS.
2. THE TRUSS MANUFACTURER SHALL SUBMIT SHOP DRAWINGS AND CALCULATIONS FOR EOR'S REVIEW PRIOR TO TRUSS FABRICATION INCLUDING TRUSS DESIGN AND LAYOUT ALONG WITH ANY DETAILING REQUIRED FOR BRACING, TRUSS CONNECTIONS OR CONNECTIONS TO THE STRUCTURE.
3. ALL TRUSS DIMENSIONS SHALL BE FIELD VERIFIED PRIOR TO FABRICATION.
4. NO. 3 GRADE LUMBER IS NOT PERMITTED IN THE FABRICATED TRUSS.
5. THE TRUSS FABRICATOR SHALL SUBMIT A CERTIFICATE OF COMPLIANCE TO THE EOR STATING THAT THE WORK WAS PERFORMED IN ACCORDANCE WITH THE APPROVED CONSTRUCTION DOCUMENTS AND SHALL ADDRESS THE FOLLOWING AS A MINIMUM:
   A. QUALITY CONTROL PROCEDURES FOR PLACEMENT AND ALIGNMENT OF GUSSETS
   B. QUALITY CONTROL PROCEDURES FOR PLACEMENT OF MEMBERS
   C. QUALITY CONTROL PROCEDURES FOR FIELD IDENTIFICATIONS AND FIELD INSTALLATIONS
6. PERMANENT BRACING SHALL BE PROVIDED IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
7. WHERE CONNECTIONS ARE REQUIRED BUT HAVE NOT BEEN SPECIFIED ON THE STRUCTURAL DRAWINGS OR TRUSS MANUFACTURER'S SHOP DRAWINGS, CONTACT THE STRUCTURAL EOR FOR APPROPRIATE CONNECTORS TO UTILIZE.
8. THE SPECIAL INSPECTOR SHALL VERIFY THAT THE PERMANENT INDIVIDUAL TRUSS MEMBER RESTRAINT/BRACING IS INSTALLED IN ACCORDANCE WITH THE APPROVED TRUSS SUBMITTAL PACKAGE.

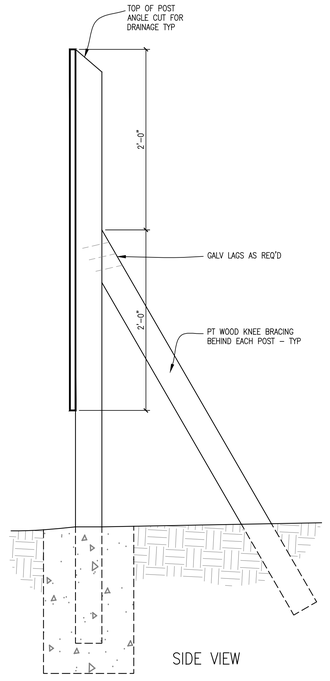
GRAPHIC LEGEND

- SMOKE TIGHT PARTITION
- 35' (125') DISTANCE TO EXIT ACCESS DOOR IN ROOM / DISTANCE TO EXIT AT BUILDING EXTERIOR / EXIT ACCESS TRAVEL (MAX 200'–0" PER KBC TABLE 1016.2)
- COMMON PATH OF EGRESS TRAVEL (MAX 75'–0" PER KBC TABLE 1014.3)
- EXIT DISCHARGE
- 300 | 3 — CALCULATED OCCUPANT LOAD FOR EACH SPACE / VALUE FROM TABLE 1004.2
- 15 — OCCUPANT LOAD ASSIGNED TO EGRESS COMPONENT



1 G-001 RESTROOM BLDG EGRESS PLAN
3/8" = 1'-0"





LETTERING STYLE: ARIAL, TYP. ALL LETTERING BESIDES LOGOS
PAINT COLOR: (1) BLACK
(2) WHITE
* COORDINATE LOGO COLOR WITH ORGANIZATION REPRESENTATIVE

2 G-001 PROJECT SIGN
N.T.S.

BUILDING CODE ANALYSIS
NEW CONSTRUCTION (2018 KBC / 2015 IBC)

NON–SPRINKLED SINGLE USE

USE GROUP	CLASS	DESIGNED AREA (SF) FLOOR #	DESIGNED AREA (SF) AREA	ALLOWABLE AREA (SF) FLOOR / HEIGHT	AREA PER FLOOR	SUPPRESSION INCREASE	FRONTAGE INCREASE	ALLOWABLE PER FLOOR
UTILITY AND MISCELLANEOUS	U	1	545 SF	1 STORY	5,500	–	–	–
	TOTAL AREA		545 SF	AREA INCLUDED WITHIN ROOF OVERHANGS = 738 SF AREA INCLUDED WITHIN ROOF OVERHANGS AND OPEN PAVILION = 2,359 SF				

CONSTRUCTION TYPE	CLASS	LOAD-BRG WALLS	EXT NON-LOAD-BRG WALLS	INT NON-LOAD-BRG WALLS	FLOOR	ROOF		
UTILITY	V–B	0 HR	0 HR	0 HR	0 HR	0 HR		
PER KBC TABLE 601								

OCCUPANCY	CLASS	USE NFPA	SF PER PERSON	DESIGNED SF	MEANS OF EGRESS OCCUPANCY	OTHER REQ'S	CALCULATED OCCUPANCY	ACTUAL OCCUPANCY
UTILITY AND MISCELLANEOUS	U	–	100/300	545 SF	5* MAX	–	5	5
					TOTAL OCCUPANCY LOAD		5	5

* MEANS OF EGRESS OCCUPANCY CALCULATED BY SF OF INDIVIDUAL FUNCTION OF SPACE DIVIDED BY OCCUPANT LOAD FACTOR (KBC TABLE 1004.1.2)

PLUMBING FIXTURES	FLOOR	OCCUPANCY TYPE	OCCUPANCY MALE (M)	OCCUPANCY FEMALE (F)	FIXTURE TYPE	REQUIRED COUNT	DESIGNED COUNT
MECHANTILE	1	U	15	15	WATER CLOSET (M)	1	1
					WATER CLOSET (F)	1	2
					LAVATORY (M)	1	1
					LAVATORY (F)	1	1
					URINAL (M)	1	1
					DRINKING FOUNTAIN	0	1

PER 2017 KBC PLUMBING CODE – FIXTURE TYPE (KBC CH. 2902). PLUMBING COUNT BASED ON CALCULATED OCCUPANCY COUNT

CMW The Shape of Ideas
Architecture
Civil Engineering
Landscape Architecture
a: 249 East Main Street Suite 100 Lexington, Kentucky 40507
o: (859) 254-6623
w: www.cmwaec.com

BILL PICKERING REGISTERED No. 29 COMMONWEALTH OF KENTUCKY LICENSED ARCHITECT
21 DECEMBER 2023

CODE REVIEW INFORMATION / EGRESS PLAN / PROJECT SIGN / STRUCTURAL NOTES

FREEMAN LAKE PARK - SHELTERS PROJECT
FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY

CONSTRUCTION DOCUMENTS

Issue Date:	December 22, 2023
Drawn By:	JMT
Checked By:	BP
Revisions:	
	-
	-
	-
	-
	-
Mark	Date

AHJ SEAL

Project Number
21049.05

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G-001

COMcheck Software Version 4.1.5.5

Envelope Compliance Certificate

Project Information

Energy Code:	2012 IECC
Project Title:	Freeman Lake Park Restroom and Pavilion Buildings
Location:	Elizabethtown, Kentucky
Climate Zone:	4a
Project Type:	New Construction

Construction Site:
Freeman Lake Park Road
Elizabethtown, KY 42701

Owner/Agent:
Ed Poppe
City of Elizabethtown
200 West Dixie Avenue - 3rd Floor
P.O. Box 550
Elizabethtown, KY 42701
270-765-2910
ed.poppe@elizabethtownky.gov

Designer/Contractor:
John M Thomas
CMW, Inc.
248 East Main St - Suite 100
Lexington, KY 40507
859-254-6623
jthomas@cmwaec.com

Additional Efficiency Package(s)
Credits: 1.0 Required 1.0 Proposed
Reduced Lighting Power, 1.0 credit

Building Area	Floor Area
1-Retail : Nonresidential	482

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor$_{alt}$
Roof 1: Attic Roof with Wood Joists, [Bldg. Use 1 - Retail]	740	38.0	0.0	0.027	0.027
Floor 1: Slab-On-Grade:Unheated, Horizontal with vertical 2 ft., [Bldg. Use 1 - Retail] (b)	105	—	10.0	0.700	0.540
NORTH					
Exterior Wall - North: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: None, [Bldg. Use 1 - Retail]	234	—	10.0	0.082	0.104
Exterior Wall - North (@ Alcove 102A): Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: None, [Bldg. Use 1 - Retail]	66	—	10.0	0.082	0.104
Door 103: Insulated Metal, Swinging, [Bldg. Use 1 - Retail]	21	—	—	0.370	0.610
EAST					
Exterior Wall - East: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: None, [Bldg. Use 1 - Retail]	273	—	10.0	0.082	0.104
Exterior Wall - East (@ Alcove 102A): Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: None, [Bldg. Use 1 - Retail]	110	—	10.0	0.082	0.104
Door 3: Insulated Metal, Swinging, [Bldg. Use 1 - Retail]	21	—	—	0.370	0.610
SOUTH					
Exterior Wall - South: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: None, [Bldg. Use 1 - Retail]	234	—	10.0	0.082	0.104
Exterior Wall - South (@ Alcove 102A): Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: None, [Bldg. Use 1 -	66	—	10.0	0.082	0.104

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor$_{alt}$
Retail					
Door 101: Insulated Metal, Swinging, [Bldg. Use 1 - Retail]	21	—	—	0.370	0.610
WEST					
Exterior Wall - West: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: None, [Bldg. Use 1 - Retail]	273	—	10.0	0.082	0.104

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.
(b) Slab-On-Grade proposed and budget U-factors shown in table are F-factors.

Envelope PASSES: Design 7% better than code

Envelope Compliance Statement

Compliance Statement: The proposed envelope design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed envelope systems have been designed to meet the 2012 IECC requirements in COMcheck Version 4.1.5.5 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

John M Thomas — Name - Title
12/21/2023 — Date

COMcheck Software Version 4.1.5.5

Inspection Checklist

Energy Code: 2012 IECC

Requirements: 0.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
C103.2 [PI1]1	Plans and/or specifications provide all information with which compliance can be determined for the building envelope and document where exceptions to the standard are claimed.	X Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
C406 [PI9]1	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the additional energy efficiency package options.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
C402.3.1 [PI10]1	The vertical fenestration area <= 30 percent of the gross above-grade wall area.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	
C402.3.1 [PI11]1	The skylight area <= 3 percent of the gross roof area.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	
C402.3.2 [PI14]1	In enclosed spaces > 10,000 ft2 directly under a roof with ceiling heights >15 ft. and used as an office, lobby, atrium, concourse, corridor, storage, gymnasium/exercise center, convention center, automotive service, manufacturing, nonrefrigerated warehouse, retail store, distribution/sorting area, transportation, or workshop, the following requirements apply: (a) the daylight zone under skylights is >= half the floor area. (b) the skylight area to daylight zone is >= 3 percent with a skylight VT >= 0.40, or a minimum skylight effective aperture >= 1 percent.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	
C402.3.2 [PI15]1	Skylights in office, storage, automotive service, manufacturing, non-refrigerated warehouse, retail store, and distribution/sorting area have a measured haze value > 90 percent unless designed to exclude direct sunlight.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Footing / Foundation Inspection	Complies?	Comments/Assumptions
C104 [FO3]1	Installed slab-on-grade insulation type and R-value consistent with insulation specifications reported in plans and COMcheck reports.	X Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values.*
C303.2 [FO4]1	Slab edge insulation installed per manufacturer's instructions.	X Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
C402.2.6 [FO5]1	Slab-edge insulation depth/length, Slab insulation extending away from building is covered by pavement or >= 10 inches of soil.	☐ Complies ☐ Does Not X Not Applicable	*See the Envelope Assemblies table for values.*
C403.2.8.1 [FO6]1	Exterior insulation protected against damage, sunlight, moisture, wind, landscaping and equipment maintenance activities.	X Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
C402.2.8 [FO12]1	Bottom surface of floor structures incorporating radiant heating insulated to >=R-3.5.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	*See the Envelope Assemblies table for values.*

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Framing / Rough-In Inspection	Complies?	Comments/Assumptions
C402.4.1, C402.4.2 [FR16]1	The building envelope contains a continuous air barrier that is sealed in an approved manner and either constructed or tested in an approved manner. Air barrier penetrations are sealed in an approved manner.	X Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
C402.4.3, C402.4.4 [FR18]1	Factory-built fenestration and doors are labeled as meeting air leakage requirements.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	
C402.4.7 [FR17]1	Vestibules are installed on all building entrances. Doors have self-closing devices.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	
C402.3.3, C402.3.4 [FR8]1	Vertical fenestration U-Factor.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	*See the Envelope Assemblies table for values.*
C402.3.3 [FR10]1	Vertical fenestration SHGC value.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	*See the Envelope Assemblies table for values.*
C303.1.3 [FR12]1	Fenestration products rated in accordance with NFRC.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	
C303.1.3 [FR13]1	Fenestration products are certified as to performance labels or certificates provided.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C402.4.5, 1 [ME3]1	Stair and elevator shaft vents have motorized dampers that automatically close.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	
C402.4.5, 2 [ME5]1	Outdoor air and exhaust systems have motorized dampers that automatically shut when not in use and meet maximum leakage rates. Check gravity dampers where allowed.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Insulation Inspection	Complies?	Comments/Assumptions
C402.4.1.1 [IN1]1	All sources of air leakage in the building thermal envelope are sealed, caulked, gasketed, weather stripped or wrapped with moisture vapor-permeable wrapping material to minimize air leakage.	X Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
C402.4.2.1 [IN2]1	Roof R-value. For some ceiling systems, verification may need to occur during Framing Inspection.	X Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values.*
C303.2 [IN3]1	Roof insulation installed per manufacturer's instructions. Blown or poured loose-fill insulation is installed on slopes where the roof slope is <=3 in 12.	X Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
C303.2 [IN7]1	Above-grade wall insulation installed per manufacturer's instructions.	X Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
C104 [IN8]1	Installed floor insulation type and R-value consistent with insulation specifications reported in plans and COMcheck reports.	X Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values.*
C303.1 [IN10]1	Building envelope insulation is labeled with R-value or insulation certificate providing R-value and other relevant data.	X Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
C303.2.1 [IN14]1	Exterior insulation is protected from damage with a protective material. Verification for exposed foundation insulation may need to occur during Foundation Inspection.	X Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C402.4.6 [FI37]1	Weatherseals installed on all loading dock cargo doors.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	
C402.4.8 [FI26]1	Recessed luminaires in thermal envelope to limit infiltration and be IC rated and labeled. Seal between interior finish and luminaire housing.	☐ Complies ☐ Does Not ☐ Not Observable X Not Applicable	

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

COMCHECK PAGE 9 OF 9 - BLANK (REMOVED FROM SET)

COMcheck Software Version 4.1.5.5

Interior Lighting Compliance Certificate

Project Information

Energy Code:	2012 IECC
Project Title:	Freeman Lake Park Restroom and Pavilion Buildings
Project Type:	New Construction

Construction Site:
Freeman Lake Park Road
Elizabethtown, KY 42701

Owner/Agent:
Ed Poppe
City of Elizabethtown
200 West Dixie Avenue - 3rd Floor
P.O. Box 550
Elizabethtown, KY 42701
270-765-2910
ed.poppe@elizabethtownky.gov

Designer/Contractor:
John M Thomas
CMW, Inc.
248 East Main St - Suite 100
Lexington, KY 40507
859-254-6623
jthomas@cmwaec.com

Additional Efficiency Package(s)
Credits: 1.0 Required 1.0 Proposed
Reduced Lighting Power, 1.0 credit

Allowed Interior Lighting Power

A Area Category	B Floor Area (ft2)	C Allowed Watts / ft2	D Allowed Watts (B X C)
1-Retail	482	1.30	627
		Total Allowed Watts =	627

Proposed Interior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
1-Retail				
A2: LED Other Fixture Unit 50W:	1	1	55	55
A4: LED Other Fixture Unit 50W:	1	8	55	440
			Total Proposed Watts =	495

Interior Lighting PASSES: Design 21% better than code

Interior Lighting Compliance Statement

Compliance Statement: The proposed interior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed interior lighting systems have been designed to meet the 2012 IECC requirements in COMcheck Version 4.1.5.5 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

W. GRANT WILSON — Name - Title
W. Grant Wilson — Signature
12/19/23 — Date

COMcheck Software Version 4.1.5.5

Exterior Lighting Compliance Certificate

Project Information

Energy Code:	2012 IECC
Project Title:	Freeman Lake Park Restroom and Pavilion Buildings
Project Type:	New Construction
Exterior Lighting Zone	4 (High activity metropolitan commercial district (LZ4))

Construction Site:
Freeman Lake Park Road
Elizabethtown, KY 42701

Owner/Agent:
Ed Poppe
City of Elizabethtown
200 West Dixie Avenue - 3rd Floor
P.O. Box 550
Elizabethtown, KY 42701
270-765-2910
ed.poppe@elizabethtownky.gov

Designer/Contractor:
John M Thomas
CMW, Inc.
248 East Main St - Suite 100
Lexington, KY 40507
859-254-6623
jthomas@cmwaec.com

Allowed Exterior Lighting Power

A Area/Surface Category	B Quantity	C Allowed Watts / Unit	D Tradable Wattage	E Allowed Watts (B X C)
Illuminated length of facade wall or surface	543 ft	No		2715
		Total Tradable Watts (a) =		0
		Total Allowed Watts =		2715
		Total Allowed Supplemental Watts (b) =		1300

(a) Wattage tradeoffs are only allowed between tradable areas/surfaces.
(b) A supplemental allowance equal to 1300 watts may be applied toward compliance of both non-tradable and tradable areas/surfaces.

Proposed Exterior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
Illuminated length of facade wall or surface (543 ft): Non-tradable Wattage				
B: LED Other Fixture Unit 36W:	1	9	38	342
C4: LED Other Fixture Unit 50W:	1	9	56	504
			Total Tradable Proposed Watts =	0

Exterior Lighting PASSES: Design 0.0% better than code

Exterior Lighting Compliance Statement

Compliance Statement: The proposed exterior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed exterior lighting systems have been designed to meet the 2012 IECC requirements in COMcheck Version 4.1.5.5 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

W. GRANT WILSON — Name - Title
W. Grant Wilson — Signature
12/19/23 — Date

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BILL PICKERING REGISTERED No. 4015 PROFESSIONAL ARCHITECT
21 DECEMBER, 2023

ENVELOPE COMPLIANCE CERTIFICATE - COMcheck 4.1.5.5

FREEMAN LAKE PARK - SHELTERS PROJECT
FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY

CONSTRUCTION DOCUMENTS

Issue Date:	December 22, 2023
Drawn By:	JMT
Checked By:	BP

Revisions:

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	-
Mark	Date

AHJ SEAL

Project Number
21049.05

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G-002

COMcheck Software Version 4.1.5.5
Mechanical Compliance Certificate

Project Information

Energy Code:	2012 IECC
Project Title:	Freeman Lake Park Restroom and Pavilion Buildings
Location:	Elizabethtown, Kentucky
Climate Zone:	4a
Project Type:	New Construction

Construction Site:	Owner/Agent:	Designer/Contractor:
Freeman Lake Park Road Elizabethtown, KY 42701	Ed Poppe City of Elizabethtown 200 West Dixie Avenue - 3rd Floor P.O. Box 550 Elizabethtown, KY 42701 270-765-2910 ed.poppe@elizabethtownky.gov	John M Thomas CMW, Inc. 248 East Main St - Suite 100 Lexington, KY 40507 859-254-6623 jthomas@cmwaec.com

Additional Efficiency Package(s)

Credits: 1.0 Required 1.0 Proposed
Reduced Lighting Power, 1.0 credit

Mechanical Systems List

Quantity	System Type & Description
1	HVAC System 1 (Single Zone): Heating: 1 each - Unit Heater (ECH-1), Electric, Capacity = 14 kBtu/h No minimum efficiency requirement applies Fan System: None
1	HVAC System 2 (Single Zone): Heating: 1 each - Unit Heater (ECH-2), Electric, Capacity = 14 kBtu/h No minimum efficiency requirement applies Fan System: None
1	HVAC System 3 (Single Zone): Heating: 1 each - Unit Heater (ECH-3), Electric, Capacity = 14 kBtu/h No minimum efficiency requirement applies Fan System: None

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2012 IECC requirements in COM*check* Version 4.1.5.5 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

W. GRANT WILSON — W. Grant Wilson — 12/19/23
Name - Title — Signature — Date

COMcheck Software Version 4.1.5.5
Inspection Checklist

Energy Code: 2012 IECC

Requirements: 0.0% were addressed directly in the COM*check* software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
C103.2 [PR2][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical systems and equipment and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C103.2 [PR4][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the interior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include interior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C103.2 [PR8][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the exterior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include exterior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C406 [PR9][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the additional energy efficiency package options.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Footing / Foundation Inspection	Complies?	Comments/Assumptions
C403.2.4.5 [FO9][3]	Freeze protection and snow/ice melting system sensors for future connection to controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.2.8 [FO12][3]	Bottom surface of floor structures incorporating radiant heating insulated to >=R-3.5.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C403.2.3 [ME55][2]	HVAC equipment efficiency verified.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.2.5.1 [ME59][1]	Demand control ventilation provided for spaces >500 sq.ft. and >25 people/1000 sq.ft. occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.7 [ME60][2]	HVAC ducts and plenums insulated. Where ducts or plenums are installed in or under a slab, verification may need to occur during Foundation Inspection.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.8 [ME61][2]	HVAC piping insulation thickness. Where piping is installed in or under a slab, verification may need to occur during Foundation Inspection.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.8 [ME61][2]	HVAC piping insulation thickness. Where piping is installed in or under a slab, verification may need to occur during Foundation Inspection.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.8 [ME61][2]	HVAC piping insulation thickness. Where piping is installed in or under a slab, verification may need to occur during Foundation Inspection.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.8.1 [ME7][3]	Piping Insulation exposed to weather is protected from damage (due to sun, moisture, wind, etc.).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.8 [ME41][3]	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.7 [ME10][2]	Ducts and plenums sealed based on static pressure and location.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.7.1.3 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.7.1.3 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.7.1.3 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C408.2.2.1 [ME53][3]	Air outlets and zone terminal devices have means for air balancing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.2 [ME66][2]	VAV fan motors >=7.5 hp to be driven by variable speed drive, have a vane-axial fan with variable pitch blades, or have controls to limit fan motor demand.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.2 [ME66][2]	VAV fan motors >=7.5 hp to be driven by variable speed drive, have a vane-axial fan with variable pitch blades, or have controls to limit fan motor demand.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.2 [ME66][2]	VAV fan motors >=7.5 hp to be driven by variable speed drive, have a vane-axial fan with variable pitch blades, or have controls to limit fan motor demand.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.6 [ME57][1]	Exhaust air energy recovery on systems meeting Table C403.2.6	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.11 [ME71][2]	Unenclosed spaces that are heated use only radiant heat.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.2.2.1 [EL22][2]	Automatic controls to shut off all building lighting installed in all buildings.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.1.1 [EL23][2]	Independent lighting controls installed per approved lighting plans and all manual controls readily accessible and visible to occupants.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.1.2 [EL15][1]	Lighting controls installed to uniformly reduce the lighting load by at least 50%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.2.3 [EL16][2]	Daylight zones provided with individual controls that control the lights independent of general area lighting.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.3 [EL17][3]	Sleeping units have at least one master switch at the main entry door that controls wired luminaires and switched receptacles.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.2.2 [EL18][1]	Occupancy sensors installed in required spaces.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.2.3 [EL20][1]	Primary sidelighted areas are equipped with required lighting controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.2.3 [EL21][1]	Enclosed spaces with daylight area under skylights and rooftop monitors are equipped with required lighting controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.4 [EL25][2]	Automatic lighting controls for exterior lighting installed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.3 [EL4][1]	Separate lighting control devices for specific uses installed per approved lighting plans.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.3 [EL19][3]	Fluorescent luminaires with odd numbered lamp configurations that are within 10 feet center to center (if recess mounted) or are within 1 foot edge to edge (if pendant or surface mounted) shall be tandem wired.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.4 [EL6][1]	Exit signs do not exceed 5 watts per face.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.6 [EL24][1]	Exterior grounds lighting over 100 W provides >60 lm/W unless on motion sensor or fixture is exempt from scope of code or from external LPD.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.3 [EL8][1]	Additional interior lighting power allowed for special functions per the approved lighting plans and is automatically controlled and separated from general lighting.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C403.2.4.1 [FI47][3]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.1 [FI47][3]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.1 [FI47][3]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.2 [FI38][3]	Thermostatic controls have a 5 °F deadband.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.2 [FI20][3]	Temperature controls have setpoint overlap restrictions.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.3 [FI39][3]	Each zone equipped with setback controls using automatic time clock or programmable control system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.3 [FI40][3]	Automatic Controls: Setback to 55°F (heat) and 85°F (cool); 7-day clock, 2-hour occupant override, 10-hour backup	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5.1 [FI7][3]	Furnished HVAC as-built drawings submitted within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C303.3, C408.2.5.3 [FI8][3]	Furnished O&M manuals for HVAC systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5.3 [FI43][1]	An air and/or hydronic system balancing report is provided for HVAC systems.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.3.2 [FI10][1]	HVAC control systems have been tested to ensure proper operation, calibration and adjustment of controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.2 [FI27][3]	HVAC systems and equipment capacity does not exceed calculated loads.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C408.2.5.1 [FI16][3]	Furnished as-built drawings for electric power systems within 30 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C303.3, C408.2.5.2 [FI17][3]	Furnished O&M instructions for systems and equipment to the building owner or designated representative.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.5.2 [FI18][1]	Interior installed lamp and fixture lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Interior Lighting fixture schedule for values.*
C405.6.2 [FI19][1]	Exterior lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Interior Lighting fixture schedule for values.*
C408.2.1 [FI28][1]	Commissioning plan developed by registered design professional or approved agency.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.4 [FI29][1]	Preliminary commissioning report completed and certified by registered design professional or approved agency.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5.4 [FI30][1]	Final commissioning report due to building owner within 90 days of receipt of certificate of occupancy.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.3.1 [FI31][1]	HVAC equipment has been tested to ensure proper operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.3 [FI33][1]	Lighting systems have been tested to ensure proper calibration, adjustment, programming, and operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.3 [FI48][1]	Lighting systems have been tested to ensure proper calibration, adjustment, programming, and operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

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ARCHITECT
21 DECEMBER 2023

ENVELOPE COMPLIANCE CERTIFICATE - COMcheck 4.1.5.5

FREEMAN LAKE PARK - SHELTERS PROJECT

FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY

CONSTRUCTION DOCUMENTS

Issue Date:	December 22, 2023
Drawn By:	JMT
Checked By:	BP

Revisions:

Mark	Date
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AHJ SEAL

Project Number
21049.05

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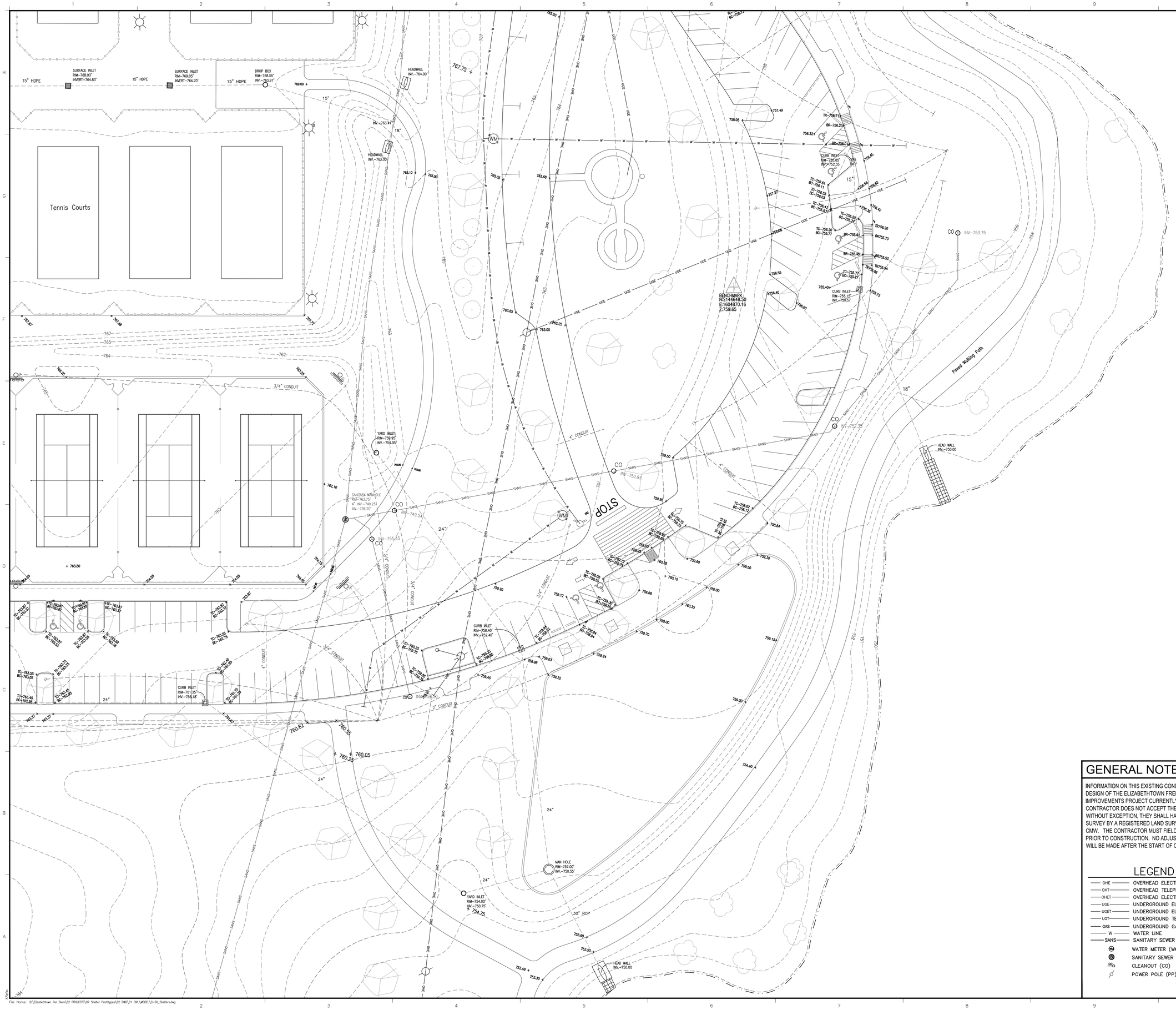

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12-22-2023

GENERAL NOTES

INFORMATION ON THIS EXISTING CONDITIONS PLAN REPRESENTS THE FINAL DESIGN OF THE ELIZABETHTOWN FREEMAN LAKE PARK - SOUTH END IMPROVEMENTS PROJECT CURRENTLY UNDER CONSTRUCTION. IF THE CONTRACTOR DOES NOT ACCEPT THE INFORMATION AS SHOWN ON THIS PLAN, WITHOUT EXCEPTION, THEY SHALL HAVE MADE, AT THEIR OWN EXPENSE, A SURVEY BY A REGISTERED LAND SURVEYOR FOR REVIEW BY THE OWNER AND CMW. THE CONTRACTOR MUST FIELD VERIFY THE EXISTING INFORMATION PRIOR TO CONSTRUCTION. NO ADJUSTMENT FOR INCORRECT INFORMATION WILL BE MADE AFTER THE START OF CONSTRUCTION.

LEGEND

- OHE — OVERHEAD ELECTRIC
- OHT — OVERHEAD TELEPHONE
- OHET — OVERHEAD ELECTRIC & TELEPHONE
- UGE — UNDERGROUND ELECTRIC
- UGET — UNDERGROUND ELECTRIC & TELEPHONE
- UGT — UNDERGROUND TELEPHONE
- GAS — UNDERGROUND GAS
- W — WATER LINE
- SANS — SANITARY SEWER LINE
- WM — WATER METER (WM)
- S — SANITARY SEWER MANHOLE
- CO — CLEANOUT (CO)
- PP — POWER POLE (PP)

N

0 20' 40'
SCALE: 1"=20'

EXISTING CONDITIONS PLAN - FOR REFERENCE ONLY

FREEMAN LAKE PARK - SHELTERS PROJECT

FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY

CONSTRUCTION DOCUMENTS

Issue Date:	December 22, 2023
Drawn By:	BR
Checked By:	BB

Revisions:	
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Project Number
21049.05

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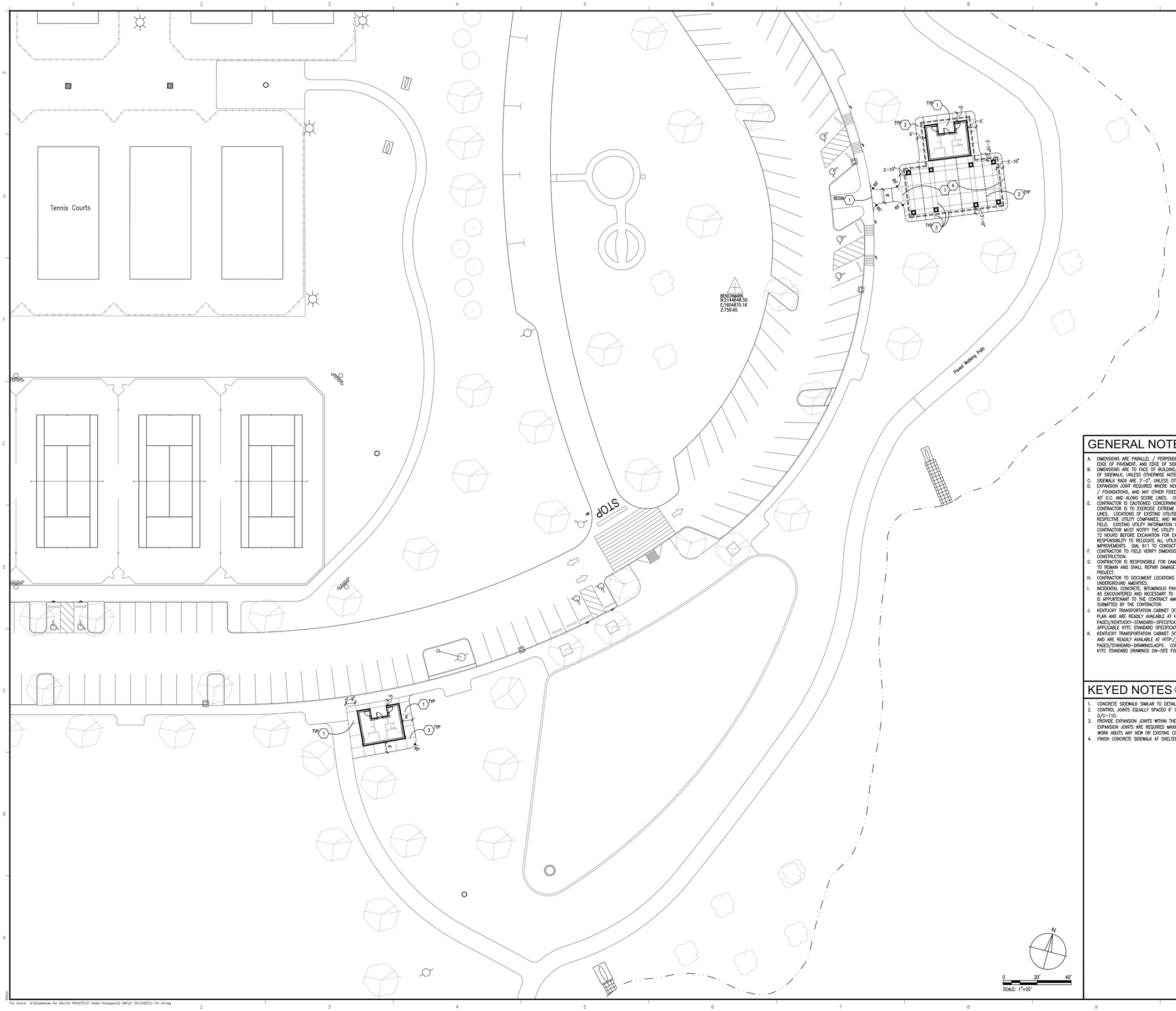

GENERAL NOTES

A. DIMENSIONS ARE PARALLEL / PERPENDICULAR TO THE FACE OF BUILDING, FACE OF CURB, EDGE OF PAVEMENT, AND EDGE OF SIDEWALK, UNLESS OTHERWISE NOTED.
B. DIMENSIONS ARE TO FACE OF BUILDING, FACE OF CURB, EDGE OF PAVEMENT, AND EDGE OF SIDEWALK, UNLESS OTHERWISE NOTED.
C. SIDEWALK RADII ARE 3'-0", UNLESS OTHERWISE NOTED.
D. EXPANSION JOINT REQUIRED WHERE NEW CONCRETE ABUTS EXISTING CONCRETE, BUILDINGS / FOUNDATIONS, AND ANY OTHER FIXED OBJECTS. EXPANSION JOINTS REQUIRED MAXIMUM 40' O.C. AND ALONG SCORE LINES. COORDINATE WITH DETAIL E/C-110.
E. CONTRACTOR IS CAUTIONED CONCERNING EXISTING UTILITIES SURROUNDING AND ON SITE. CONTRACTOR IS TO EXERCISE EXTREME CAUTION WHEN WORKING NEAR EXISTING UTILITY LINES. LOCATIONS OF EXISTING UTILITIES ARE BASED ON THE RECORDS OF THE RESPECTIVE UTILITY COMPANIES, AND WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. EXISTING UTILITY INFORMATION IS NOT TO BE TAKEN AS EXACT OR COMPLETE. CONTRACTOR MUST NOTIFY THE UTILITY COMPANIES AND APPROPRIATE AGENCIES AT LEAST 72 HOURS BEFORE EXCAVATION FOR EXACT FIELD LOCATIONS. IT IS THE CONTRACTORS RESPONSIBILITY TO RELOCATE ALL UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS. DIAL 811 TO CONTACT B.U.D. FOR LOCATION OF EXISTING UTILITIES.
F. CONTRACTOR TO FIELD VERIFY DIMENSIONS PRIOR TO DEMOLITION AND LAYOUT FOR NEW CONSTRUCTION.
G. CONTRACTOR IS RESPONSIBLE FOR DAMAGE TO STRUCTURES, PAVEMENT, UTILITIES, ETC. TO REMAIN AND SHALL REPAIR DAMAGE AS THE RESULT OF THE CONSTRUCTION OF THIS PROJECT.
H. CONTRACTOR TO DOCUMENT LOCATIONS OF FOUND UTILITIES AND MISCELLANEOUS UNDERGROUND AMENITIES.
I. INCIDENTAL CONCRETE, BITUMINOUS PAVEMENT, OTHER DEMOLITION AND SUB-GRADE FILL AS ENCOUNTERED AND NECESSARY TO FULFILL THE DESIGN INTENT OF THE PLANS HEREIN IS APPURTENANT TO THE CONTRACT AMOUNT AND SHALL BE INCORPORATED INTO THE BID SUBMITTED BY THE CONTRACTOR.
J. KENTUCKY TRANSPORTATION CABINET (KYTC) STANDARD SPECIFICATIONS ARE PART OF THIS PLAN AND ARE READILY AVAILABLE AT HTTP://TRANSPORTATION.KY.GOV/CONSTRUCTION/PAGES/KENTUCKY-STANDARD-SPECIFICATIONS.ASPX. CONTRACTOR TO KEEP A COPY OF APPLICABLE KYTC STANDARD SPECIFICATIONS ON-SITE FOR REFERENCE.
K. KENTUCKY TRANSPORTATION CABINET (KYTC) STANDARD DRAWINGS ARE PART OF THIS PLAN AND ARE READILY AVAILABLE AT HTTP://TRANSPORTATION.KY.GOV/HIGHWAY-DESIGN/PAGES/STANDARD-DRAWINGS.ASPX. CONTRACTOR MUST KEEP A COPY OF THE APPLICABLE KYTC STANDARD DRAWINGS ON-SITE FOR REFERENCE.

KEYED NOTES

1. CONCRETE SIDEWALK SIMILAR TO DETAIL A/C-110.
2. CONTROL JOINTS EQUALLY SPACED 6' O.C. MAX IN ALL CONCRETE SIDEWALKS PER DETAIL D/C-110.
3. PROVIDE EXPANSION JOINTS WITHIN THE SPACING MODULE OF THE CONTROL JOINTS. EXPANSION JOINTS ARE REQUIRED MAXIMUM OF 40' APART AND WHERE ANY CONCRETE WORK ABUTS ANY NEW OR EXISTING CONCRETE PER DETAIL C/C-110.
4. FINISH CONCRETE SIDEWALK AT SHELTER AREA PER DETAIL B/C-110.

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12-22-2023

SITE LAYOUT AND DIMENSIONING PLAN

FREEMAN LAKE PARK - SHELTERS PROJECT

FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY

CONSTRUCTION DOCUMENTS

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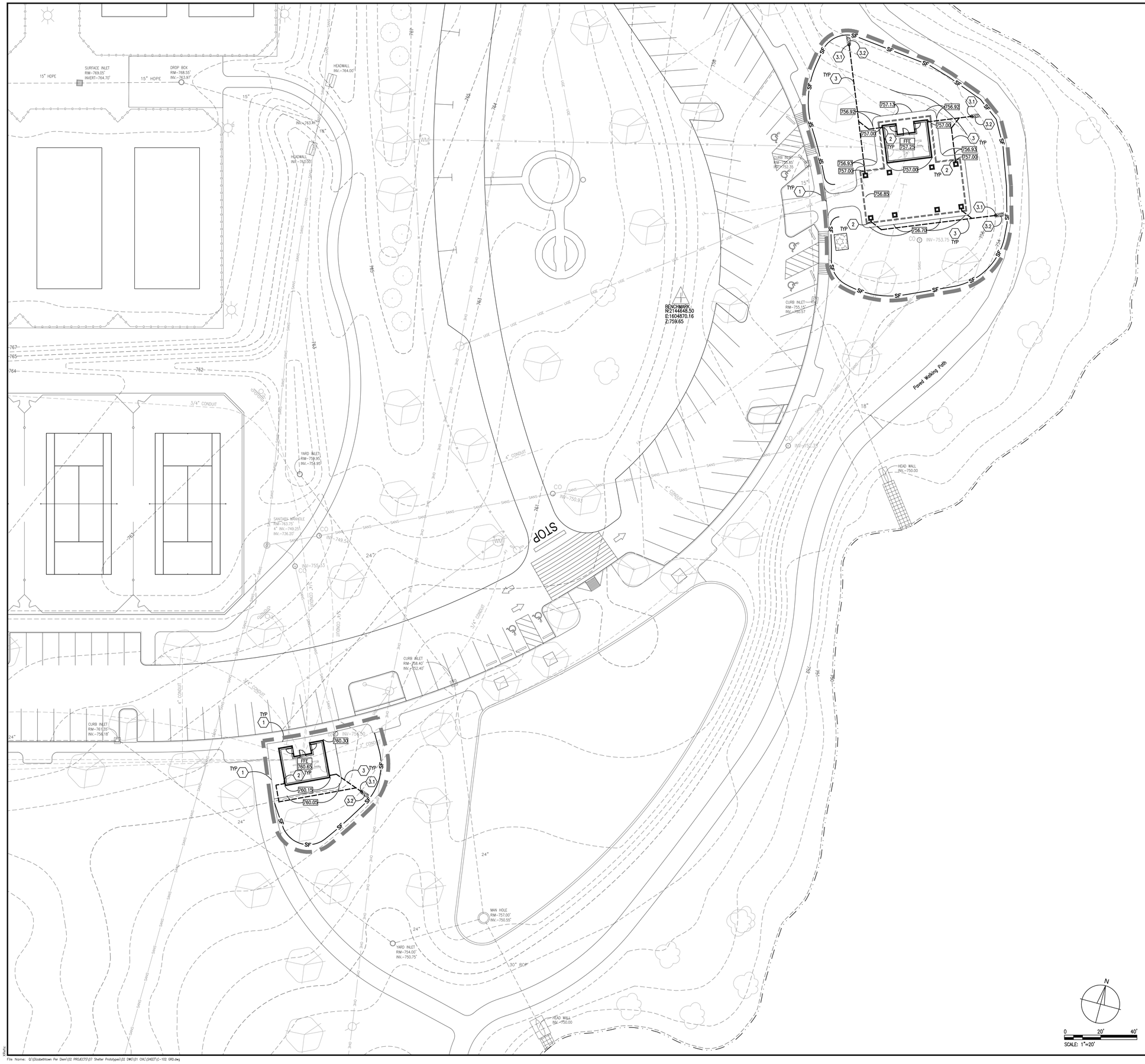

EROSION CONTROL LEGEND

LIMITS OF DISTURBANCE

SF — TEMPORARY WOVEN WIRE REINFORCED SILT FENCE PER KYTC STD DWG NO. RDX-215 AND KEPSC BMP MANUAL SECTION 4.5.1.

TEMPORARY CONCRETE WASH OUT PER KEPSC BMP MANUAL SECTION 4.9.6. EXACT LOCATION TO BE DETERMINED BY CONTRACTOR. CONCRETE WASH OUT IS TO BE A 2' DEEP PIT LINED WITH 10-MIL PLASTIC SHEETING, AND MUST BE AT LEAST 50' FROM STORM INLETS. CONCRETE WASH OUT IS TO BE CLEANED AND NEW PLASTIC SHEETING INSTALLED ONCE THE CONCRETE WASH IS 1" DEEP.

EROSION CONTROL NOTES

A. IMPLEMENT THE APPROVED EROSION CONTROL PLAN PRIOR TO LAND-DISTURBING ACTIVITY.
B. MAINTAIN MEASURES STATED ON THIS PLAN IN FUNCTIONAL CONDITION UNTIL THE DRAINAGE AREA UPSTREAM OF THE MEASURE HAS BEEN STABILIZED.
C. CONTRACTOR MUST BE FAMILIAR WITH AND ADHERE TO THE REQUIREMENTS OF THE KPDES GENERAL PERMIT FOR STORM WATER POINT SOURCE DISCHARGES.
D. CLEAN EROSION CONTROL DEVICES ONCE DEVICE HAS REACHED 1/3 CAPACITY.
E. IMMEDIATELY REPAIR OR REPLACE DAMAGED EROSION CONTROL DEVICES.
F. TAKE ACTIONS TO MINIMIZE THE TRACKING OF MUD AND SOIL FROM CONSTRUCTION AREAS ONTO PUBLIC ROADWAYS. CONTRACTOR TO REMOVE SOIL OR DEBRIS TRACKED ONTO THE ROADWAY IMMEDIATELY.
G. LOCATE SOIL STOCKPILES AWAY FROM STREAMS, PONDS, SWALES AND CATCH BASINS. CONTRACTOR TO ADEQUATELY CONTAIN SOIL STOCKPILES THROUGH THE USE OF SEED, MULCH, AND/OR SILT FENCE.
H. PUMP SEDIMENT-LADEN GROUNDWATER ENCOUNTERED DURING TRENCHING, BORING, OR OTHER EXCAVATION ACTIVITIES TO AN EROSION CONTROL DEVICE PRIOR TO DISCHARGING INTO A STREAM, SWALE OR CATCH BASIN.
I. HOLD CLEARING TO MINIMUM AMOUNT NECESSARY, AND SEQUENCE CONSTRUCTION TO MINIMIZE EXPOSURE OF CLEARED & GRADED AREAS.
J. WHERE LAND DISTURBANCE ACTIVITY HAS TEMPORARILY CEASED ON ANY PORTION OF A SITE, CONTRACTOR SHALL PROVIDE TEMPORARY SEEDING MEASURES MEETING KEPSC BMP MANUAL SECTION 4.4.1 AS SOON AS PRACTICABLE, BUT NO LATER THAN 14 CALENDAR DAYS AFTER THE ACTIVITY HAS CEASED. TEMPORARY SEEDING IS GOOD FOR 180 DAYS, AFTER 180 DAYS PERMANENT SEEDING IS NECESSARY.
Q. WHERE LAND DISTURBANCE ACTIVITY HAS PERMANENTLY CEASED ON ANY PORTION OF A SITE, CONTRACTOR SHALL PROVIDE PERMANENT SEEDING OR SODDING MEASURES MEETING KEPSC BMP MANUAL SECTION 4.4.2 AS SOON AS PRACTICABLE, BUT NO LATER THAN 14 CALENDAR DAYS AFTER THE ACTIVITY HAS CEASED.
R. KENTUCKY EROSION PREVENTION AND SEDIMENT CONTROL (KEPSC) BEST MANAGEMENT PRACTICES (BMP) MANUAL IS PART OF THIS EROSION CONTROL PLAN, AND IS READILY AVAILABLE AT HTTP://WWW.KYT2.COM/PUBLICATIONS. CONTRACTOR MUST KEEP A COPY OF THE KEPSC BMP MANUAL ON-SITE FOR REFERENCE.
S. KENTUCKY TRANSPORTATION CABINET (KYTC) STANDARD DRAWINGS ARE PART OF THIS EROSION CONTROL PLAN, AND ARE READILY AVAILABLE AT HTTP://TRANSPORTATION.KY.GOV/HIGHWAY-DESIGN/PAGES/STANDARD-DRAWINGS.ASPX. CONTRACTOR MUST KEEP A COPY OF THE KYTC STANDARD DRAWINGS ON-SITE FOR REFERENCE.
T. THIS EROSION CONTROL PLAN EFFECTIVELY CONTROLS EROSION FROM DISTURBED SOILS AND WASH WATER. HOWEVER, NO PLAN CAN BE MADE THAT DETAILS ALL POSSIBLE EROSION CONTROL MEASURES THROUGHOUT CONSTRUCTION. CONTRACTOR IS TO PROVIDE ADEQUATE FUNDS IN THEIR BID TO COMPLY WITH REQUIREMENTS OF THE CITY OF ELIZABETHTOWN AND KENTUCKY DIVISION OF WATER.
U. CONTRACTOR TO IMMEDIATELY CONTAIN AND CLEAN UP ANY ILLICIT SPILLS, MAINTAIN OIL AND GREASE ABSORBING MATERIALS ON-SITE, AND PLAINLY LABEL CONTAINERS THAT ARE SUSCEPTIBLE TO SPILLING/LEAKING TO FACILITATE PROPER RESPONSE IF SPILLS/LEAKS OCCUR. CONTRACTOR IS TO MARK THE LOCATION OF ANY MAJOR SPILL OR LEAK ON THE EROSION CONTROL PLAN. WHEN MAJOR SPILLS ENTER A WATERWAY OR STORM SEWER CONTACT THE KENTUCKY DIVISION OF WATER AT 502-564-2380.
V. CONTRACTOR IS TO DEPOSIT RUBBISH, TRASH, GARBAGE, LITTER, ETC. IN SEALED/COVERED CONTAINERS.
W. CONTRACTOR IS TO APPLY WATER WHEN NECESSARY TO CONTROL DUST. WATER TANKER TO SPRAY WATER OVER AFFECTED AREAS PREVENTING DUST FROM BECOMING AIRBORNE. CARE SHOULD BE TAKEN TO PREVENT EXCESS WATER FROM CAUSING EROSION PROBLEMS.
X. CONCRETE TRUCKS MUST WASH OUT ON-SITE INTO A TRAPPING DEVICE.
Y. AS DESIGNED, THERE IS LESS THAN ONE (1) ACRE DISTURBED. IF DURING CONSTRUCTION THE LIMITS OF DISTURBANCE INCREASE TO ONE (1) ACRE OR MORE, CONTRACTOR MUST SECURE A K.P.D.E.S. NOTIFICATION OF COVERAGE PRIOR DISTURBING ONE (1) ACRE OR MORE OF LAND. THE K.P.D.E.S. NOTICE OF INTENT (NOI) MUST BE SUBMITTED AT LEAST SEVEN (7) DAYS BEFORE DISTURBING ONE (1) ACRE OR MORE OF LAND USING THE ONLINE E-PERMITTING WEB SITE.
Z. CONTRACTOR TO KEEP A SEALED EROSION CONTROL PLAN ON-SITE, AND MAKE IT AVAILABLE TO INSPECTORS FROM THE CITY OF ELIZABETHTOWN AND KENTUCKY DIVISION OF WATER.
AA. CONTRACTOR (AT THEIR OWN EXPENSE) IS TO AMEND THE EROSION CONTROL PLAN AS NECESSARY. ALL NECESSARY MODIFICATIONS TO THE EROSION CONTROL PLAN MUST BE COMPLETED BEFORE THE NEXT STORM EVENT WHENEVER POSSIBLE AND NO LATER THAN SEVEN (7) CALENDAR DAYS AFTER DISCOVERING THE NEED FOR MODIFICATION. CONTRACTOR IS TO CLEARLY MARK CHANGES THAT ARE MADE, THE LOCATION OF FUELING STATIONS, MAINTENANCE AND CLEANING AREAS, LOADING AREAS, AND LOCATIONS WHERE MATERIALS ARE EXPOSED TO PRECIPITATION ON THE EROSION CONTROL PLAN.
AB. EROSION CONTROL MEASURES, DISCHARGE LOCATIONS, VEHICLE EXITS, DISTURBED AREAS, AND STORAGE AREAS MUST BE INSPECTED BY QUALIFIED PERSONNEL EMPLOYED BY THE CONTRACTOR. THE INSPECTIONS MUST BE DONE AT LEAST ONCE EVERY SEVEN (7) CALENDAR DAYS, OR AT LEAST ONCE EVERY FOURTEEN (14) CALENDAR DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT EQUAL TO 1/2 INCH OR GREATER. REPORTS OF THE INSPECTIONS MUST BE KEPT ON-SITE AND MADE AVAILABLE TO INSPECTORS FROM THE CITY OF ELIZABETHTOWN AND KENTUCKY DIVISION OF WATER.

GRADING GENERAL NOTES

A. CONTRACTOR IS TO EXERCISE EXTREME CAUTION WHEN WORKING NEAR EXISTING UTILITY LINES. THE EXISTING UTILITY INFORMATION IS NOT TO BE TAKEN AS EXACT OR COMPLETE. THE CONTRACTOR MUST NOTIFY THE UTILITY COMPANIES AND APPROPRIATE AGENCIES AT LEAST 72 HOURS BEFORE EXCAVATION FOR EXACT FIELD LOCATIONS. IT IS THE CONTRACTORS RESPONSIBILITY TO RELOCATE ALL UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS. DIAL 811 TO CONTACT B.U.D. FOR LOCATION OF EXISTING UTILITIES.
B. CONTRACTOR TO VERIFY INVERT ELEVATIONS OF THE DRAINAGE STRUCTURES PRIOR TO CONSTRUCTION.
C. ENCASE UTILITY LINES IN CONCRETE IF MINIMUM DEPTH OF BURY IS NOT ACHIEVED. WORK TO BE DONE PER RESPECTIVE UTILITY COMPANY SPECIFICATIONS.
D. IF AN EXISTING GRADING AND DRAINAGE ITEM IS DAMAGED DURING CONSTRUCTION, IT IS THE CONTRACTORS RESPONSIBILITY TO REPAIR OR REPLACE THE ITEM AS NECESSARY TO RETURN IT TO PRE-CONSTRUCTION CONDITIONS.
E. SPREAD A MINIMUM OF 4" GOOD, CLEAN, WEED FREE TOPSOIL OVER CLEAN SUBGRADE IN AREAS TO BE SEEDED. REMOVE ALL CONSTRUCTION DEBRIS, TRASH AND SIGNIFICANT ROCKS FROM SUBGRADE.
F. UNPAVED AREAS DISTURBED DURING CONSTRUCTION OF THIS PROJECT ARE TO BE SEEDED WITH STRAW MULCH. CONTRACTOR TO WATER SEEDED AREAS UNTIL A HEALTHY STAND OF GRASS IS ESTABLISHED.
G. CONTRACTOR TO PROVIDE POSITIVE DRAINAGE IN LAWNS & PAVEMENT AND AWAY FROM BUILDINGS.
H. DRAIN PIPES ARE TO BE PROPERLY TRENCHED AND JACKETED WITH CRUSHED STONE PER DETAIL E/C-110.
I. ELIZABETHTOWN STORMWATER ORDINANCES ARE PART OF THIS GRADING AND DRAINAGE PLAN, AND ARE READILY AVAILABLE AT HTTP://WWW.ELIZABETHTOWNKY.ORG/STORMWATER.ASP. CONTRACTOR MUST KEEP A COPY OF THE ELIZABETHTOWN ORDINANCES ON-SITE FOR USE AND REFERENCE.
J. KENTUCKY TRANSPORTATION CABINET (KYTC) STANDARD SPECIFICATIONS ARE PART OF THIS PLAN AND ARE READILY AVAILABLE AT HTTP://TRANSPORTATION.KY.GOV/CONSTRUCTION/PAGES/KENTUCKY-STANDARD-SPECIFICATIONS.ASPX. CONTRACTOR MUST KEEP A COPY OF THE KYTC STANDARD SPECIFICATIONS ON-SITE FOR USE AND REFERENCE.
K. GAS, WATER AND/OR ELECTRIC VALVE/METER LIDS AND STORM WATER/SANITARY MANHOLE LIDS TO REMAIN WITHIN THE PROJECT AREA ARE TO BE ADJUSTED TO MATCH THE FINISHED FINAL GRADE WHETHER INDICATED OR NOT.
L. MAXIMUM CROSS-SLOPE OF WALK TO BE 1.8% TOWARDS THE TOP OF CURB AND/OR STREET, TYPICAL.
M. MAXIMUM CROSS-SLOPE OF BITUMINOUS WALKING PATH TO BE 1.8% TOWARD FREEMAN LAKE.
N. MEET EXISTING GRADES OF ADJACENT ASPHALT DRIVES, WALKS, ROADS AND PARKING AREAS, TYP. PROVIDE A SMOOTH FLUSH CONNECTION.
O. SEE SITE SURVEY FOR TEMPORARY BENCHMARKS.
P. SUB-GRADE TO BE PROOF-ROLLED WITH A FULLY LOADED DUMP TRUCK IN THE PRESENCE OF THE GEOTECHNICAL ENGINEER. AREAS THAT PUMP, RUT OR WAVE DURING PROOF-ROLLING ARE TO BE SCARIFIED 12" DEEP, RE-COMPACTED, AND PROOF-ROLLED AGAIN WITH A FULLY LOADED DUMP TRUCK IN THE PRESENCE OF THE GEOTECHNICAL ENGINEER. AREAS THAT PUMP, RUT OR WAVE AFTER THE SECOND PROOF-ROLL ARE TO BE UNDERCUT AND REPLACED WITH ENGINEERED FILL UNTIL SUB-GRADE PASSES PROOF-ROLL.

GRADING KEYED NOTES ⬡

1. NEW CONCRETE TO MEET EXISTING CONCRETE WITH A SMOOTH, FLUSH CONNECTION, TYP.
2. DOWNSPOUT CONNECTION TO ROOF DRAIN WITH 4" PVC PIPE PER DETAIL G/C-110, TYPICAL. PROVIDE 1% MIN. POSITIVE SLOPE AND 18" MIN. COVER DEPTH. COORDINATE WITH BUILDING PLANS FOR EXACT NUMBER OF AND LOCATION OF DOWNSPOUTS. DOWNSPOUT BOOTS TO MATCH ADJACENT PARK BUILDINGS.
3. 4" PVC ROOF DRAIN PIPE FROM BUILDING DOWNSPOUTS TO DAYLIGHT DETAIL E/C-110. PROVIDE 1% MIN. POSITIVE SLOPE AND 18" MIN. COVER DEPTH. EXACT ROUTE TO BE FIELD DETERMINED BY CONTRACTOR.
3.1. CUT/MITER THE OUTLET OF THE ROOF DRAIN PIPE TO MATCH THE ADJACENT SLOPE AND POUR 6" THICK CONCRETE HEADWALL AROUND OUTLET.
3.2. PROVIDE 12" THICK x 24" WIDE x 48" LONG NO. 2 CRUSHED STONE OUTLET PROTECTION. EXCAVATE AREA 12" BELOW GRADE BEFORE INSTALLING CHANNEL LINING SO THAT TOP OF CRUSHED STONE IS FLUSH WITH ADJACENT GRADE AND BOTTOM OF CRUSHED STONE IS 12" BELOW GRADE.

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SITE GRADING AND EROSION CONTROL PLAN

FREEMAN LAKE PARK - SHELTERS PROJECT

FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY

CONSTRUCTION DOCUMENTS

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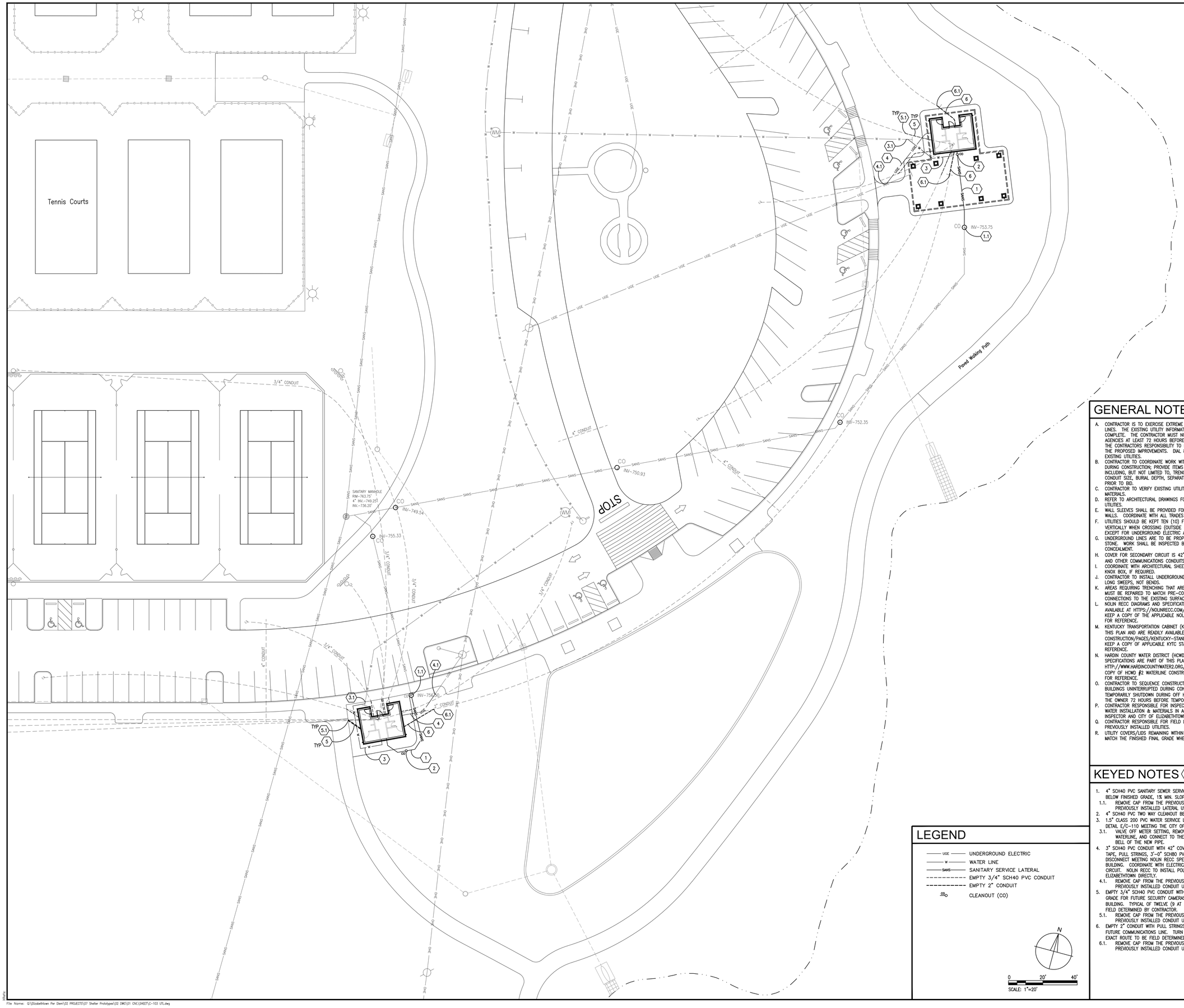

GENERAL NOTES

A. CONTRACTOR IS TO EXERCISE EXTREME CAUTION WHEN WORKING NEAR EXISTING UTILITY LINES. THE EXISTING UTILITY INFORMATION IS NOT TO BE TAKEN AS EXACT OR COMPLETE. THE CONTRACTOR MUST NOTIFY THE UTILITY COMPANIES AND APPROPRIATE AGENCIES AT LEAST 72 HOURS BEFORE EXCAVATION FOR EXACT FIELD LOCATIONS. IT IS THE CONTRACTORS RESPONSIBILITY TO RELOCATE ALL UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS. DIAL 811 TO CONTACT B.U.D. FOR LOCATION OF EXISTING UTILITIES.

B. CONTRACTOR TO COORDINATE WORK WITH THE UTILITY COMPANIES PRIOR TO BID AND DURING CONSTRUCTION; PROVIDE ITEMS REQUIRED BY THE UTILITY COMPANIES INCLUDING, BUT NOT LIMITED TO, TRENCHING, BACKFILL, CONDUIT, ETC; AND VERIFY CONDUIT SIZE, BURIAL DEPTH, SEPARATION, PULL STRINGS, BUILDING ANCHORS, ETC. PRIOR TO BID.

C. CONTRACTOR TO VERIFY EXISTING UTILITIES IN THE FIELD PRIOR TO ORDERING MATERIALS.

D. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT BUILDING ENTRY LOCATIONS FOR UTILITIES.

E. WALL SLEEVES SHALL BE PROVIDED FOR CONDUIT, PIPING, ETC. THRU STRUCTURAL WALLS. COORDINATE WITH ALL TRADES PRIOR TO CONSTRUCTION.

F. UTILITIES SHOULD BE KEPT TEN (10) FEET APART PARALLEL AND 18 INCHES APART VERTICALLY WHEN CROSSING (OUTSIDE EDGE OF PIPE TO OUTSIDE EDGE OF PIPE) EXCEPT FOR UNDERGROUND ELECTRIC AND COMMUNICATIONS.

G. UNDERGROUND LINES ARE TO BE PROPERLY TRENCHED AND JACKETED WITH CRUSHED STONE. WORK SHALL BE INSPECTED BY LOCAL UTILITIES PRIOR TO BACK FILL OR CONCEALMENT.

H. COVER FOR SECONDARY CIRCUIT IS 42" MIN. COVER FOR ALL TELEPHONE, FIBER, CATV AND OTHER COMMUNICATIONS CONDUITS IS 30" MIN.

I. COORDINATE WITH ARCHITECTURAL SHEETS FOR LOCATION AND REQUIREMENTS OF A KNOX BOX, IF REQUIRED.

J. CONTRACTOR TO INSTALL UNDERGROUND ELECTRIC AND COMMUNICATIONS CONDUIT USING LONG SWEEPS, NOT BENDS.

K. AREAS REQUIRING TRENCHING THAT ARE NOT PART OF THE HARDSCAPE IMPROVEMENTS MUST BE REPAIRED TO MATCH PRE-CONSTRUCTION CONDITIONS MAKING SMOOTH FLUSH CONNECTIONS TO THE EXISTING SURFACES TO REMAIN.

L. NOLIN RECC DIAGRAMS AND SPECIFICATIONS ARE PART OF THIS PLAN AND ARE READILY AVAILABLE AT HTTPS://NOLINRECC.COM/DIAGRAMS-AND-SPECS/. CONTRACTOR MUST KEEP A COPY OF THE APPLICABLE NOLIN RECC DIAGRAMS AND SPECIFICATIONS ON-SITE FOR REFERENCE.

M. KENTUCKY TRANSPORTATION CABINET (KYTC) STANDARD SPECIFICATIONS ARE PART OF THIS PLAN AND ARE READILY AVAILABLE AT HTTP://TRANSPORTATION.KY.GOV/CONSTRUCTION/PAGES/KENTUCKY-STANDARD-SPECIFICATIONS.ASPX. CONTRACTOR TO KEEP A COPY OF APPLICABLE KYTC STANDARD SPECIFICATIONS ON-SITE FOR REFERENCE.

N. HARDIN COUNTY WATER DISTRICT (HCWD) #2 WATERLINE CONSTRUCTION STANDARDS AND SPECIFICATIONS ARE PART OF THIS PLAN AND ARE READILY AVAILABLE AT HTTP://WWW.HARDINCOUNTYWATER2.ORG/SPECIFICATIONS.ASP. CONTRACTOR TO KEEP A COPY OF HCWD #2 WATERLINE CONSTRUCTION STANDARDS AND SPECIFICATIONS ON-SITE FOR REFERENCE.

O. CONTRACTOR TO SEQUENCE CONSTRUCTION TO KEEP UTILITY SERVICES TO ADJACENT BUILDINGS UNINTERRUPTED DURING CONSTRUCTION. UTILITY SERVICES CAN BE TEMPORARILY SHUTDOWN DURING OFF HOURS FOR LESS THAN TWO (2) HOURS. NOTIFY THE OWNER 72 HOURS BEFORE TEMPORARY SHUTDOWNS.

P. CONTRACTOR RESPONSIBLE FOR INSPECTION & TESTING OF THE SANITARY SEWER AND WATER INSTALLATION & MATERIALS IN ACCORDANCE WITH HARDIN COUNTY PLUMBING INSPECTOR AND CITY OF ELIZABETHTOWN REQUIREMENTS.

Q. CONTRACTOR RESPONSIBLE FOR FIELD DETERMINING THE EXACT LOCATIONS OF THE PREVIOUSLY INSTALLED UTILITIES.

R. UTILITY COVERS/LIDS REMAINING WITHIN THE PROJECT AREA ARE TO BE ADJUSTED TO MATCH THE FINISHED FINAL GRADE WHETHER INDICATED OR NOT.

KEYED NOTES ⬡

1. 4" SCH40 PVC SANITARY SEWER SERVICE LATERALS AND FITTINGS WITH 24" MIN. COVER BELOW FINISHED GRADE, 1% MIN. SLOPE, AND 2% MAX. SLOPE PER DETAIL E/C-110.
   1.1. REMOVE CAP FROM THE PREVIOUSLY INSTALLED LATERAL, AND CONNECT TO THE PREVIOUSLY INSTALLED LATERAL USING THE BELL OF THE NEW PIPE.
2. 4" SCH40 PVC TWO WAY CLEANOUT BEFORE ENTERING BUILDING PER DETAIL F/C-110.
3. 1.5" CLASS 200 PVC WATER SERVICE LINE WITH 36" COVER BELOW FINISHED GRADE PER DETAIL E/C-110 MEETING THE CITY OF ELIZABETHTOWN REQUIREMENTS.
   3.1. VALVE OFF METER SETTING, REMOVE CAP FROM THE PREVIOUSLY INSTALLED WATERLINE, AND CONNECT TO THE PREVIOUSLY INSTALLED WATERLINE USING THE BELL OF THE NEW PIPE.
4. 3" SCH40 PVC CONDUIT WITH 42" COVER BELOW FINISHED GRADE, DETECTABLE WARNING TAPE, PULL STRINGS, 3'-0" SCH80 PVC ELBOWS, SCH80 PVC RISERS, METER BASE, AND DISCONNECT MEETING NOLIN RECC SPECIFICATIONS FOR SECONDARY ELECTRIC TO THE BUILDING. COORDINATE WITH ELECTRICAL PLANS FOR MORE INFORMATION ON SECONDARY CIRCUIT. NOLIN RECC TO INSTALL POLE MOUNTED TRANSFORMER AND METER; AND BILL ELIZABETHTOWN DIRECTLY.
   4.1. REMOVE CAP FROM THE PREVIOUSLY INSTALLED CONDUIT, AND CONNECT TO THE PREVIOUSLY INSTALLED CONDUIT USING THE BELL OF THE NEW PIPE.
5. EMPTY 3/4" SCH40 PVC CONDUIT WITH PULL STRINGS AND 24" COVER BELOW FINISHED GRADE FOR FUTURE SECURITY CAMERAS. TURN UP CONDUIT AT TEL/COM BOARD INSIDE BUILDING. TYPICAL OF TWELVE (9 AT RESTROOM, 3 AT PAVILION). EXACT ROUTE TO BE FIELD DETERMINED BY CONTRACTOR.
   5.1. REMOVE CAP FROM THE PREVIOUSLY INSTALLED CONDUIT, AND CONNECT TO THE PREVIOUSLY INSTALLED CONDUIT USING THE BELL OF THE NEW PIPE.
6. EMPTY 2" CONDUIT WITH PULL STRINGS AND 24" COVER BELOW FINISHED GRADE FOR FUTURE COMMUNICATIONS LINE. TURN UP CONDUIT AT TEL/COM BOARD INSIDE BUILDING. EXACT ROUTE TO BE FIELD DETERMINED BY CONTRACTOR.
   6.1. REMOVE CAP FROM THE PREVIOUSLY INSTALLED CONDUIT, AND CONNECT TO THE PREVIOUSLY INSTALLED CONDUIT USING THE BELL OF THE NEW PIPE.

LEGEND

- UGE — UNDERGROUND ELECTRIC
- W — WATER LINE
- SANS — SANITARY SERVICE LATERAL
- EMPTY 3/4" SCH40 PVC CONDUIT
- EMPTY 2" CONDUIT
- CLEANOUT (CO)

N

0 20' 40'

SCALE: 1"=20'

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LICENSED PROFESSIONAL ENGINEER
12-22-2023

FREEMAN LAKE PARK - SHELTERS PROJECT

FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY

SITE UTILITIES PLAN

CONSTRUCTION DOCUMENTS

Issue Date:	December 22, 2023
Drawn By:	BR
Checked By:	BB

Revisions:	
	-
	-
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	-
	-
Mark	Date

AHJ SEAL

Project Number
21049.05

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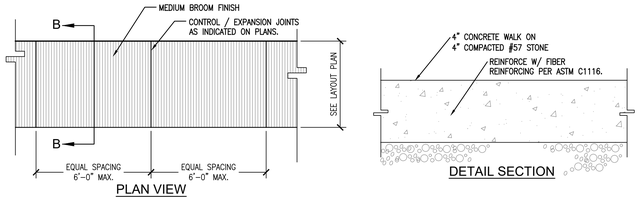
C-103

XRefs:
C-SP_Shelters C-SP_Shelters 21049.05_42X30SHT C-102 GRD PD-Stamp & Sig
File Name: Q:\Elizabethtown Per Diem\02 PROJECTS\07 Shelter Prototypes\02 DWG\01 CM\SHEET\C-103 UTL.dwg
PLOT DATE: 3/16/2018 1:50:01 PM

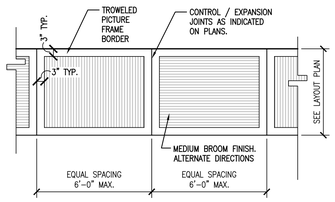
CONCRETE SIDEWALK NOTES
- CONCRETE TO BE CLASS 'A' PER KYTC STANDARD SPECIFICATIONS.
- CONCRETE TO BE 3,500 PSI, MINIMUM.
- CONCRETE TO HAVE AN AIR CONTENT OF 6% ±2%.
- CONCRETE SLUMP TO BE 3" ±1"
- CONCRETE TO BE REINFORCED WITH MACRO-SYNTHETIC FIBERS AT A RATE OF 4 LBS PER CUBIC YARD PER ASTM C1116.
- USE WATER-REDUCING AND RETARDING ADMIXTURE WHEN REQUIRED BY HIGH TEMPERATURES, LOW HUMIDITY, OR OTHER ADVERSE PLACEMENT CONDITIONS PER INDUSTRY STANDARDS.
- PROVIDE CLEAR, WATERBORNE MEMBRANE-FORMING CURING COMPOUND PER INDUSTRY STANDARDS.
- PROVIDE MEDIUM BROOM FINISH, UNLESS OTHERWISE NOTED.
- SIDEWALK TO HAVE 1.8% MAXIMUM CROSS SLOPE.



PLAN VIEW

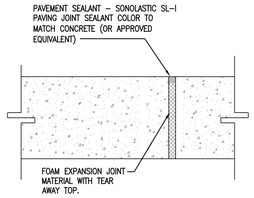
DETAIL SECTION

A CONCRETE SIDEWALK
N.T.S.

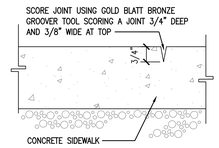


PLAN VIEW

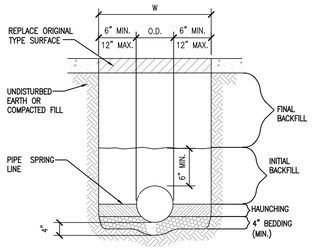
B ENHANCED JOINTING & FINISHING
N.T.S.



C EXPANSION JOINT
NOT TO SCALE



D CONTROL JOINT
NOT TO SCALE



GENERAL NOTE:
MATERIALS AND METHODS ARE TO MEET THE REQUIREMENTS OF THE KENTUCKY TRANSPORTATION CABINET SPECIFICATIONS, LATEST EDITION.

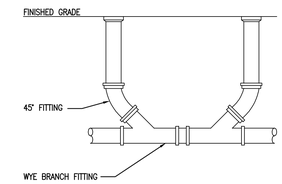
PAVEMENT REPAIR NOTES:
1. REPLACE ASPHALT, CONCRETE, CURB, AND STONE BASE WITH SAME TYPE & DEPTH AS EXISTING.
2. ASPHALT, CONCRETE, & STONE BASE MATERIALS AND METHODS ARE TO MEET THE REQUIREMENTS OF THE KENTUCKY TRANSPORTATION CABINET SPECIFICATIONS, LATEST EDITION.
3. COMPLETELY BACKFILL TRENCHES WITH COMPACTED CRUSHED STONE AS CONSTRUCTED IN ORDER TO MAINTAIN TRAFFIC.

LANDSCAPE REPAIR NOTES:
1. REPLACE GRASS, TOPSOIL, TREES, AND LANDSCAPING WITH SAME TYPE & DEPTH AS EXISTING.
2. SPREAD AT LEAST 4" OF TOPSOIL IN DISTURBED LANDSCAPE AREAS, THEN SEED AND MULCH.
3. IMMEDIATELY STABILIZE DISTURBED AREAS AS CONSTRUCTED.

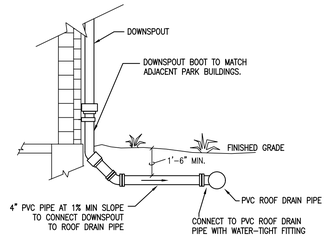
TRENCHING AND BEDDING NOTES
1. BEDDING SHALL BE NO. 9 CRUSHED STONE WORKED BY HAND AND COMPACTED.
2. HAUNCHING SHALL BE NO. 9 CRUSHED STONE WORKED AROUND THE PIPE BY HAND TO ELIMINATE VOIDS AND COMPACTED.
3. INITIAL BACKFILL SHALL BE NO. 9 CRUSHED STONE WORKED BY HAND AND COMPACTED.
4. FINAL BACKFILL IN PAVED AREAS SHALL BE COMPACTED CRUSHED STONE.
5. FINAL BACKFILL IN LANDSCAPE AREAS CAN BE SELECT SOIL COMPACTED TO 95% STANDARD PROCTOR WITH NO ROCK GREATER THAN 3/4 INCH.
6. MATERIALS SHALL BE INSTALLED IN MAXIMUM 8" LOOSE LIFTS IN ACCORDANCE WITH ASTM D 698.
7. FILL SALVAGED FROM EXCAVATION SHALL BE FREE OF DEBRIS AND ORGANICS.
8. TRENCH EXCAVATIONS SHALL BE SLOPED, SHORED, SHEETED, BRACED, OR OTHERWISE SUPPORTED IN COMPLIANCE WITH OSHA REGULATIONS AND LOCAL CODES.

E TRENCHING AND BEDDING
NOT TO SCALE

GENERAL NOTES:
1. PIPE AND FITTINGS SHALL BE SCHEDULE 40 PVC
2. JOINTS GLUED OR GASKET
3. 6" MINIMUM NO. 9 CRUSHED STONE EMBEDMENT



F TWO-WAY CLEANOUT
N.T.S.



G DOWNSPOUT CONNECTION
N.T.S.

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SITE DETAILS

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C-110

SITE

- B.M. — BENCH MARK
- T.B. — TEST BORING
- F.H. — FIRE HYDRANT
- M.H. — MANHOLE
- C.B. — CATCH BASIN
- C.I. — CURB INLET
- UTILITY POLE
- LIGHT STANDARD
- TREE
- 222.0 — EXISTING SPOT ELEVATION
- 222.0 — PROPOSED SPOT ELEVATION
- 222.0 — EXISTING CONTOURS
- 222.0 — PROPOSED CONTOURS
- EXISTING STRUCTURE TO REMAIN
- EXISTING STRUCTURE TO BE REMOVED
- W — WATER
- SANS — SANITARY SEWER
- STORM SEWER SYSTEM
- EUT — EXISTING UNDERGROUND TELEPHONE
- OHT — EXISTING OVERHEAD TELEPHONE
- TEL — TELEPHONE
- EUP — EXISTING UNDERGROUND ELECTRIC
- OHE — EXISTING OVERHEAD ELECTRIC
- E — ELECTRIC
- OHC — OVERHEAD CABLE
- C — GAS
- DT — FOUNDATION DRAIN TILE
- X X X — FENCE
- ℄ — CENTER LINE
- PROPERTY LINE

MATERIALS

- EARTH
- CRUSHED STONE, GRAVEL
- CONCRETE
- BRICK
- CONCRETE BLOCK, CMU
- STONE
- SLATE
- MARBLE
- FRAMING WOOD: CONTINUOUS
- INTERMITTENT WOOD BLOCKING
- FINISH WOOD
- PLYWOOD
- STRUCTURAL STEEL: LARGE SCALE
- ALUMINUM
- STRUCTURAL STEEL: SMALL SCALE
- GLASS
- BATT INSULATION
- RIGID INSULATION
- ACOUSTICAL TILE
- PLASTER: LARGE SCALE
- GYPSUM BOARD
- CARPET
- GYPSUM SHEATHING
- TAPERED ROOF INSULATION

ANNOTATION AND SYMBOLS

- DETAIL — ZZZ / A-XXXX — DETAIL IDENTIFICATION NUMBER; NUMBER OF SHEET ON WHICH DETAIL IS DRAWN
- SECTION CUT — ZZZ / A-XXX — SECTION IDENTIFICATION NUMBER; NUMBER OF SHEET ON WHICH SECTION IS DRAWN; INDICATES DIRECTION SECTION IS DRAWN
- EXTERIOR & INTERIOR ELEVATION — ZZZ / A-XXXX — ELEVATION IDENTIFICATION NUMBER; NUMBER OF SHEET ON WHICH ELEVATION IS DRAWN
- DETAIL CROSS REFERENCE
- A — DETAIL — 1/8" = 1'-0" — SCALE AT WHICH DETAIL IS DRAWN; IDENTIFICATION LETTER ON SHEET WHERE DRAWN
- 3" — DIMENSION (FEET AND INCHES); TICK DENOTES DIMENSION TO EDGE / CORNER; DOT DENOTES DIMENSION TO CENTERLINE
- 100 — STANDARD DOOR
- MENS / 129 — ROOM NAME; ROOM NUMBER
- XX — WINDOW TYPE; WINDOW NUMBER
- XXXX — DOORS; SEE DOOR TAG LEGEND
- A — PARTITION TYPE
- 1 — ADD 2 X 4 BRACING @ 16" O.C. — REVISION SYMBOL; REVISION NOTE
- ℄ — CENTERLINE
- ⊥ — PERPENDICULAR
- // — PARALLEL
- ℗ — PLATE
- ø — ROUND
- □ — SQUARE
- 4 — KEYNOTE NO.
- PLAN NORTH / TRUE NORTH

ABBREVIATIONS

A

@	AT
AAV	AUTOMATIC AIR VENT
AB	ANCHOR BOLT
A/C	AIR CONDITIONING
ACC. FL	ACCESSIBLE FLOOR
ACOUS	ACOUSTICAL
ACT	ACTUAL
AD	AREA DRAIN, ACCESS DOOR
ADA	AMERICANS WITH DISABILITIES ACT
ADDIT	ADDITIONAL
ADJ	ADJUST, ADJUSTABLE
ADH	ADHESIVE
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AGG	AGGREGATE
AHU	AIR HANDING UNIT
ALUM, AL	ALUMINUM
AMB	AMBIENT
AMP	AMPERE
ANCH	ANCHOR
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
AP	ACCESS PANEL
APPROX	APPROXIMATE
ARCH	ARCHITECTURAL
ASB	ASBESTOS
AUTO	AUTOMATIC
AUX	AUXILIARY

B

BD	BOARD, BOILER DRAIN
BETW	BETWEEN
BEV	BEVELED
BFC	BELOW FINISHED CEILING
BFP	BACKFLOW PREVENTER
BIT	BITUMINOUS
BLDG	BUILDING
BLK	BLOCK
BLKG	BLOCKING
BM	BEAM, BENCH MARK
BO	BOTTOM OF
BOT	BOTTOM
BRNG	BEARING
BTU	BRITISH THERMAL UNIT
BUR	BUILT UP ROOFING

C

C	COURSES, CONDUIT, CUBIC
CAB	CABINET
CB	CONCRETE BLOCK, CASING BEAD, CATCH BASIN, CIRCUIT BREAKER
C/C	CENTER TO CENTER (SAME MEANING AS OC)
CCTV	CLOSED CIRCUIT TELEVISION
CEM	CEMENT
CER	CERAMIC
CF	CUBIC FEET
CFM	CUBIC FEET PER MINUTE
CHAN	CHANNEL, CAST IRON
CKT	CIRCUIT
CKT-BKR	CIRCUIT BREAKER
CJ	CONTROL JOINT
CLG	CEILING
CLOS	CLOSET
CLR	CLEAR
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CO	CLEANOUT
CO2	CARBON DIOXIDE
COEFF	COEFFICIENT
COL	COLUMN
CONC	CONCRETE
COND	CONDITION, CONDENSER, CONDENSATE
CONST	CONSTRUCTION
CONT	CONTINUOUS, CONTINUATION
CONTR	CONTRACTOR
CONV	CONVERTER, CONVENIENCE
CORR	CORRIDOR, CORRUGATED
CR	COLD ROLLED
CSG	CASING
CT	CERAMIC TILE
CTSK	COUNTERSINK
CU	CONDENSING UNIT, COPPER
CUH	CABINET UNIT HEATER
CULV	CULVERT
CV	CHECK VALVE
CW	COLD WATER, CLOCKWISE
CY	CUBIC YARD

D

DACT	DIGITAL ALARM COMMUNICATOR TRANSMITTER
DBL	DOUBLE
DEP	DEPRESSED
DET	DETAIL; DETECTOR
DF	DRINKING FOUNTAIN
DH	DOUBLE HUNG
DIA	DIAMETER
DIM	DIMENSION
DISC	DISCONNECT
DISCH	DISCHARGE
DISTR	DISTRIBUTION
DMPR	DAMPER
DN	DOWN
DO	DITTO
DS	DOWN SPOUT
DW	DRYWALL, DOMESTIC WATER
DWG(S)	DRAWING(S)

E

EA	EACH
EF	EXHAUST FAN
EFL	EFFLUENT
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRIC, ELECTRICAL
ELEV	ELEVATOR, ELEVATION
EMER	EMERGENCY
ENCL	ENCLOSURE
ENTR	ENTRANCE
EQ	EQUAL
EOL	END OF LINE RESISTOR
EQUIV	EQUIVALENT
ESMT	EASEMENT
EUH	ELECTRIC UNIT HEATER
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EWEF	EACH WAY EACH FACE
EWH	ELECTRIC WATER HEATER
EXCAV	EXCAVATE
EXCHGR	EXCHANGER
EXH	EXHAUST
EXIST	EXISTING
EXPAN	EXPANSION
EXT	EXTERIOR

F

FA	FORCED AIR, FIRE ALARM
FAB	FABRICATE
FACP	FIRE ALARM CONTROL PANEL
FC	FIRE CODE
FCU	FAN COIL UNIT
FD	FLOOR DRAIN, FIRE DAMPER
FDN	FOUNDATION
FE	FIRE EXTINGUISHER
FTW	FIRE TREATED WOOD
FFE	FINISHED FLOOR ELEVATION
FH	FLAT HEAD, FIRE HOSE, FIRE HYDRANT
FIN	FINISH, FINISHED
FIXT	FIXTURE
FL	FLOOR
FLASH	FLASHING
FLEX	FLEXIBLE
FLUOR	FLUORESCENT
FS	FLOW SWITCH
FT	FOOT OR FEET
FTG	FOOTING
FURR	FURRING
FV	FIELD VERIFY

G

GA	GAUGE
GALV	GALVANIZED
GB	GRAB BAR
GCB	GLAZED CONCRETE BLOCK
GD	GRAVITY DAMPER
GEN	GENERATOR
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GH	GRAVITY HOOD
GI	GALVANIZED IRON
GL	GLASS, GLAZING
GLUE LAM	GLUE-LAMINATED
GND	GROUND
GPM	GALLONS PER MINUTE
GR	GRADE
GRV	GRAVITY ROOF VENT
GST	GLAZED STRUCTURAL TILE
GWH	GAS WATER HEATER
GV	GRAVITY VENT
GYP	GYPSUM

H

H	HIGH
HARD	HARDENED
HB	HOSE BIBB
HC	HOLLOW CORE
HDBD	HARD BOARD
HDCP	HANDICAPPED
HDR	HEADER
HDWE	HARDWARE
HDWD	HARDWOOD
HEX	HEXAGONAL
HID	HIGH INTENSITY DISCHARGE
HOL	HOLLOW
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HP	HIGH POINT, HORSE POWER, HEAT PUMP
HPS	HIGH PRESSURE SODIUM
HRU	HEAT RECOVERY UNIT
HT	HEIGHT
HTG	HEATING
HTR	HEATER
HV	HEAT & VENTILATION UNIT
HVAC	HEATING, VENTILATION AND AIR CONDITIONING
HW	HOT WATER, HARD WHITE

I

ICF	INSULATED CONCRETE FORM
ID	INSIDE DIAMETER
IF	INSIDE FACE
IN	INCH, INCHES
INSUL	INSULATION, INSULATE
INT	INTERIOR
INTL	INTERNATIONAL
INV	INVERT

J

JB	JUNCTION BOX
JCT, J	JUNCTION
JST	JOIST
JT	JOINT

K

KBC	KENTUCKY BUILDING CODE (EDITION YEAR)
KCMIL	ONE THOUSAND CIRCULAR MILS
KW	KILO-WATT
KWH	KILO-WATT HOUR
KVA	KILO-VOLT AMPERE
KVAR	KILO-VOLT AMPERES REACTIVE

L

L	ANGLE, LONG, LEFT
LAM	LAMINATE
LAV	LAVATORY
LF	LIGHT FIXTURE, LINEAR FEET
LH	LEFT HAND
LOC	LOCATION
LP	LOW POINT
LT	LIGHT
LTG(S)	LIGHTING, LIGHTS
LTWT	LIGHTWEIGHT

M

MAS	MASONRY
MAV	MANUAL AIR VENT
MATL	MATERIAL
MAU	MAKE UP AIR UNIT
MAX	MAXIMUM
MC	MISCELLANEOUS CHANNEL
MCC	MOTOR CONTROL CENTER
MCM	ONE THOUSAND CIRCULAR MILS
MDO	MEDIUM DENSITY OVERLAY
MDP	MAIN DISTRIBUTION PANEL
MECH	MECHANICAL
MED	MEDIUM, MEDICINE
MET	METAL
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
ML & P	METAL LATH AND PLASTER
MMB	MEMBRANE
MO	MASONRY OPENING
MS	MOP SINK
MSB	MAIN SWITCHBOARD
MTD	MOUNTED
MTG	MOUNTING
MTR	MOTOR
MULL	MULLION

N

N/A	NOT APPLICABLE
NEC	NECESSARY
NEUT	NEUTRAL
NIC	NOT IN CONTRACT
NO.	NUMBER, NORMALLY OPEN
NOM	NOMINAL
NTS	NOT TO SCALE

O

OA	OUTSIDE AIR
OBSC	OBSCURE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OFD	OVERFLOW DRAIN
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED OWNER INSTALLED
OH	OVERHEAD
OLF	OUTSIDE LIGHTING FIXTURE
OPNG	OPENING
OPP	OPPOSITE
OPP H	OPPOSITE HAND
ORD	OVERFLOW ROOF DRAIN

P

PARTN	PARTITION
PART BD	PARTICLE BOARD
PASS	PASSAGE
PC	PRECAST
P/C	POURED CONCRETE
PE	PHOTOELECTRIC EYE
PEMB	PRE-ENGINEERED METAL BUILDING
PERF	PERFORATED
PERIM	PERIMETER
PERP	PERPENDICULAR
PF	POWER FACTOR
PH, P	PHASE
PIV	POST INDICATOR VALVE
PLAS	PLASTER
PLAM	PLASTIC LAMINATE
PLBG	PLUMBING
PLYWD	PLYWOOD
PNEU	PNEUMATIC
POL	POLISHED
POLY CARB	POLYCARBONATE SHEET
PREFAB	PREFABRICATED
PRI	PRIMARY
PROJ	PROJECT, PROJECTED
PPG	POLISHED PLATE GLASS
PR	PAIR
PRV	PRESSURE REDUCING VALVE, PRESSURE RELIEF VALVE
PS	PRESSURE SWITCH
PT	POINT
PTW	PRESSURE TREATED WOOD
PTRV	PRESSURE & TEMPERATURE RELIEF VALVE
PU	PUMP
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PWG	POLISHED WIRE GLASS

Q

QT	QUARRY TILE
QTR	QUARTER
QUAN	QUANTITY

R

RIS, R	RISER
RAD, R	RADIUS
RA	RETURN AIR
RCP	REINFORCED CONCRETE PIPE
RCVR	RECEIVER
RD	ROOF DRAIN
REBAR	REINFORCING BAR
RECIRC	RECIRCULATE
RECP(S)	RECEPTACLE(S)
RECT	RECTIFIER
REF	REFERENCE
REFR	REFRIGERATOR
REG	REGISTER
REINF	REINFORCE
REQD	REQUIRED
RET	RETAINING, RETURN
RESIL	RESILIENT
REV	REVISE, REVISION
RF	RETURN FAN

R

RH	RIGHT HAND, ROUND HEAD
RHEO	RHEOSTAT
RL	ROOF LEADER
RM	ROOM
RO	ROUGH OPENING
ROW, R/W	RIGHT OF WAY
RR	RESTROOM
RTU	ROOF TOP UNIT
RVCP	REINFORCED VITRIFIED CLAY PIPE
RV	RELIEF VALVE
RVD	RELIEF VALVE DISCHARGE

S

S	SINK
SA	SUPPLY AIR
SC	SOLID CORE, SILL COCK, SELF CLOSING
SCHED	SCHEDULE
SCR	SILICON CONTROLLED RECTIFIER
SEC	SECONDARY
SECT	SECTION, SECTIONAL
SEP	SEPARATE
SF	SUPPLY FAN
SHR	SHOWER
SHT	SHEET
SHEATH	SHEATHING
SIM	SIMILAR
SM	SHEET METAL
SN	SOLID NEUTRAL
SOL	SOLENOID
SPA	SPACES
SPEC(S)	SPECIFICATION(S)
SPKR	SPEAKER
SQ	SQUARE
SS	STAINLESS STEEL
ST	STAIN
S-T	SMOKE-TIGHT
STA	STATION
STD	STANDARD
STL	STEEL
STO	STORAGE
STRUCT	STRUCTURAL
SUB	SUBSTITUTE
SUCT	SUCTION
SUSP	SUSPENDED
SV	SHEET VINYL
SW	SWITCH
SWBD	SWITCHBOARD
SYMM	SYMMETRICAL
SYS	SYSTEM

T

T	TREAD, TOP
TC	TOP OF CURB, TERRA COTTA
TCE	TOP OF CURB ELEVATION
TDS	TURNED DOWN SLAB
TEL	TELEPHONE
TERR	TERRAZZO
TFE	TOP OF FOOTING ELEVATION
T&G	TONGUE AND GROOVE
THK	THICK, THICKNESS
THRESH	THRESHOLD
TKBD	TACKBOARD
TOC	TOP OF CONCRETE
TOIL	TOILET
TOPG	TOPPING
TOS	TOP OF STEEL
TRMT	TREATMENT
TS	THICK SLAB, STRUCTURAL STEEL TUBING, TAMPER SWITCH
TSTAT	THERMOSTAT
TTC	TELEPHONE TERMINAL CABINET
TOW	TOP OF WALL
TV	TELEVISION
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION

U

UG	UNDERGROUND
UH	UNIT HEATER
UNFIN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
UR	URINAL
UV	UNIT VENTILATOR

V

V	VOLT
VAC	VACUUM, VOLTS ALTERNATING CURRENT
VAP BARR	VAPOR BARRIER
VCT	VINYL COMPOSITION TILE
VCP	VITRIFIED CLAY PIPE
VDC	VOLTS DIRECT CURRENT
VENT	VENTILATE
VERT	VERTICAL
VEST	VESTIBULE
VERMIC	VERMICULITE
VTR	VENT THRU ROOF

W

W	WIDE, WATTS
W/	WITH
WC	WATER CLOSET
WD	WOOD, WINDOW DIMENSION
WDW	WINDOW
WH	WEEP HOLE, WALL HYDRANT, WATER HEATER
WHA	WATER HAMMER ARRESTOR
WI	WROUGHT IRON
WP	WATERPROOFING, WEATHERPROOF, WHITE PINE
WR	WATER RESISTANT
WAIN	WAINSCOT
WV	WALL VENT
WWF	WELDED WIRE FABRIC

X

X	BY
XFMR	TRANSFORMER

Y

YD	YARD, YARD DRAIN
YH	YARD HYDRANT

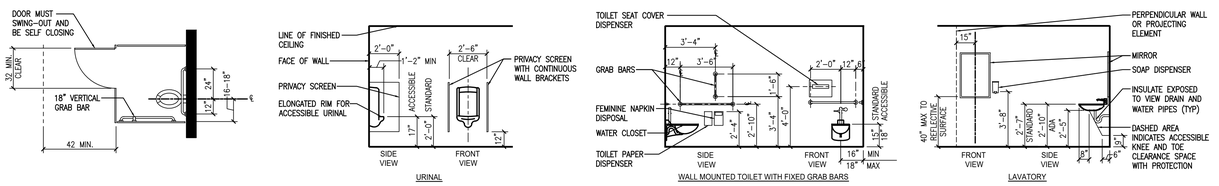
SHEET NUMBERING

- A Architectural
- C Civil
- D Demolition
- E Electrical
- F Fire Protection
- G General
- H Hazardous Mat.
- I Interiors
- L Landscaping
- M Mechanical
- O Operations
- P Plumbing
- Q Equipment
- R Resource
- S Structural
- T Telecomm
- V Survey/Mapping
- X Other
- Z Contr/Shop Dwgs

- 0 General (symbols legend, notes, etc)
- 1 Plans (horizontal views)
- 2 Elevations (vertical exterior views)
- 3 Sections (building sectional views)
- 4 Large Scale Views (plans, interior elevations, & sections)
- 5 Details
- 6 Schedules and Diagrams
- 7 User Defined
- 8 User Defined
- 9 3D Representation (isometrics, perspectives, photographs)

GENERAL NOTES

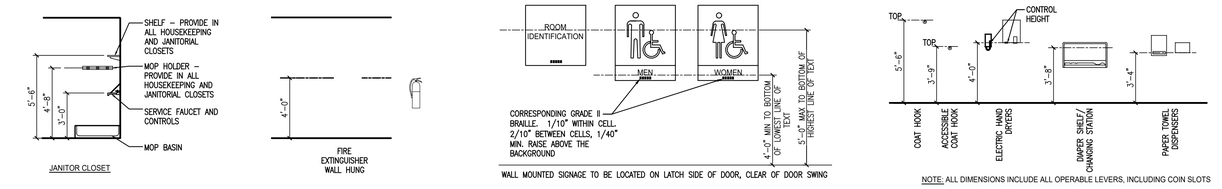
1. ALL ABBREVIATIONS, SYMBOLS AND OTHER INFORMATION ON THIS SHEET MAY NOT NECESSARILY HAVE BEEN USED ON THIS PROJECT. THEY SHALL, HOWEVER, APPLY TO THIS PROJECT WHERE THEY ARE FOUND TO OCCUR.
2. ALL EXISTING CONDITIONS SHALL BE FIELD VERIFIED. REPORT ANY FIELD CONDITIONS THAT ARE DIFFERENT FROM WHAT IS SHOWN IN THESE DOCUMENTS TO THE ARCHITECT.
3. INSPECT ALL EXISTING SUBSTRATES PRIOR TO PROCEEDING WITH NEW WORK, BRING ANY DEFICIENCY TO THE ATTENTION OF THE ARCHITECT.
4. ADJACENT FACILITIES WILL REMAIN OCCUPIED AND IN-USE DURING THE ENTIRETY OF THE PROJECT. CONDUCT NEW CONSTRUCTION SO OWNER'S OPERATIONS WILL NOT BE DISRUPTED.
5. PROVIDE TEMPORARY BARRICADES AND OTHER PROTECTION REQUIRED TO PREVENT INJURY TO PEOPLE AND DAMAGE TO ADJACENT BUILDINGS AND FACILITIES. PROVIDE PROTECTION TO ENSURE SAFE PASSAGE OF PEOPLE AROUND NEW CONSTRUCTION AREAS
6. REFER TO ANSI/ICC A-117.1 2009 FOR CONFIRMATION OF MOUNTING HEIGHTS AND THE ANSI REQUIREMENTS THAT PROVIDE ADDITIONAL INFORMATION
7. PROVIDE MILDEW-RESISTANT SEALANT BETWEEN FIXTURES & SUBSTRATES
8. REFER TO DIMENSION AND ENLARGED FLOOR PLANS FOR LOCATION OF PARTITION TYPES
9. REFER TO INTERIOR ELEVATIONS, DIMENSION PLANS AND FINISH PLANS FOR FINAL FINISHES ON PARTITIONS. PARTITION TYPE IN CHARTS REFER TO BASE WALL ONLY
10. PARTITIONS ARE DIMENSIONED TO THE FACE OF CMU, UNLESS NOTED OTHERWISE
11. ISOLATE NON-LOAD BEARING FRAMING FROM STRUCTURAL ELEMENTS TO PREVENT THE TRANSFER OF LOAD TO PARTITION FRAMING.
12. INSTALL CONTROL JOINTS AT LOCATIONS INDICATED ON DRAWINGS AND WHERE REQUIRED ACCORDING TO ASTM C 840, AND IN SPECIFIC LOCATIONS APPROVED BY ARCHITECT FOR VISUAL EFFECT



NOTE: ACCESSIBLE AND NON-ACCESSIBLE PLUMBING FIXTURES ARE INDICATED IN THE PLUMBING DRAWINGS. SYMBOLS ARE GENERIC REPRESENTATIONS ONLY. REFER TO SPECIFICATIONS FOR ACTUAL PRODUCTS.

1 A-001 Accessible Toilet Compartment — 1/4" = 1'-0"

2 A-001 Restroom Accessories — 1/4" = 1'-0"



NOTE: ALL DIMENSIONS INCLUDE ALL OPERABLE LEVERS, INCLUDING COIN SLOTS

3 A-001 Janitor's Closet — 1/4" = 1'-0"

4 A-001 Fire Protection Equipment — 1/4" = 1'-0"

5 A-001 Code Signage ADA Details — N.T.S.

6 A-001 Equipment and Accessories — 1/4" = 1'-0"

WALL TYPES

PLAN DETAIL	TYPE	FIRE / SMOKE RATING	WALL THICKNESS	WALL ASSEMBLY (ORGANIZED TOP TO BOTTOM)	HEIGHT	ACOUSTICAL (STC RATING)	THERMAL	NOTE
INTERIOR / EXTERIOR	1A EXTERIOR (LOWER)	N/A	1'-2"	04 2000 7 5/8" CONCRETE MASONRY UNIT 07 2000 2" RIGID INSULATION (R-10ci) 07 2500 - CONTINUOUS AIR BARRIER 3/4" AIR SPACE 04 7200 3 5/8" CAST STONE VENEER	VARIES	N/A	R-13	-
INTERIOR / EXTERIOR	1B EXTERIOR (UPPER)	N/A	~1'-0"	04 2000 7 5/8" CONCRETE MASONRY UNIT 07 2000 2" RIGID INSULATION (R-10ci) 06 1600 1/2" GLASS-MAT COVER BOARD 07 2500 - CONTINUOUS AIR BARRIER 06 1053 3/4" TREATED EXT GRADE WOOD FURRING STRIPS 07 4645 5/16" FIBER CEMENT VERTICAL PANEL SIDING 07 4645 3/4" FIBER CEMENT VERTICAL BATTEN BOARDS 07 4645 1" FIBER CEMENT TRIM BOARD	VARIES	N/A	R-13	-
INTERIOR / INTERIOR	2A INTERIOR	N/A	7 5/8"	04 2000 7 5/8" CONCRETE MASONRY UNIT	10'-8"	N/A	N/A	-
INTERIOR / INTERIOR	2B INTERIOR	N/A	5 5/8"	04 2000 7 5/8" CONCRETE MASONRY UNIT	8'-0"	N/A	N/A	-

ARCHITECTURAL ABBREVIATIONS AND SYMBOLS / WALL TYPES

FREEMAN LAKE PARK - SHELTERS PROJECT

FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY

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BILLY JOE PICKERING — REGISTERED — No. 25915 — COMMONWEALTH OF KENTUCKY — LICENSED ARCHITECT — 21 DECEMBER 2023

CONSTRUCTION DOCUMENTS

Issue Date:	December 22, 2023
Drawn By:	JMT
Checked By:	BP
Revisions:	-
	-
	-
	-
	-
Mark	Date

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Project Number **21049.05**

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A-001

GENERAL NOTES:

1. TYPICAL NOTES & DETAILS ARE PROVIDED TO COVER GENERAL CONSTRUCTION CONDITIONS. THE CONTRACTOR SHALL FOLLOW THOSE DETAILS & NOTES PERTAINING TO THE SPECIFIC NATURE OF THE WORK TO BE PERFORMED.

2. NOTES & DETAILS ON THESE STRUCTURAL DRAWINGS SHALL APPLY UNLESS SPECIFICALLY SHOWN OR NOTED OTHERWISE. DETAILS ARE SHOWN IN DIAGRAMMATIC FORM AND ARE NOT TO BE SCALED (SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS, ELEVATIONS, SLOPES, FINISHES, ETC.). CONSTRUCTION DETAILS NOT SHOWN OR NOTED SHALL BE SIMILAR TO DETAILS SHOWN FOR SIMILAR CONDITIONS. ALL WORK OR CONSTRUCTION SHALL COMPLY WITH THE CURRENT BUILDING CODE AND ALL OTHER APPLICABLE REGULATIONS & SAFETY REQUIREMENTS.

3. THE SPECIFICATIONS ARE INTENDED TO AUGMENT THE STRUCTURAL DRAWINGS AND ARE AN INTEGRAL PART OF THE CONSTRUCTION DOCUMENTS. SHOULD THE DRAWINGS DIFFER FROM THE SPECIFICATIONS, NOTIFY THE ENGINEER FOR CLARIFICATION.

4. DISCREPANCIES – IN THE EVENT OF A DISCREPANCY IN THE STRUCTURAL CONSTRUCTION DOCUMENTS, THE NOTE OR DETAIL UTILIZING THE STRICTER REQUIREMENT SHALL APPLY.

5. EXCAVATION, SHORING, & BRACING – IT SHALL BE THE CONTRACTOR'S SOLE RESPONSIBILITY TO DESIGN AND PROVIDE ADEQUATE SHORING, BRACING, FORM WORK, ETC., AS REQUIRED FOR PROTECTION OF LIFE & PROPERTY, TO SUPPORT ANY CONSTRUCTION LOADS, AND TO MAINTAIN ALL BUILDING COMPONENTS SAFELY IN PLACE PRIOR TO THEIR FINAL ASSEMBLY AND ANCHORAGE INTO THE COMPLETED STRUCTURE.

6. ICON SHALL NOT BE RESPONSIBLE IN ANY WAY FOR CONSTRUCTION MEANS ,METHODS, SEQUENCES, OR PROCEDURES SINCE THESE ARE THE CONTRACTORS SOLE RESPONSIBILITY UNDER THE CONTRACT.

7. INSPECTIONS – ALL INSPECTION AND TESTING SHALL BE PERFORMED ACCORDING TO BUILDING CODE AND/OR MORE STRINGENT REQUIREMENTS OF THESE PLANS.

8. COORDINATION – REFER TO THE MECHANICAL, ELECTRICAL, PLUMBING, AND ALL OTHER PERTINENT DRAWINGS FOR THE SIZE AND LOCATION OF PIPE, VENT, DUCT, AND OTHER OPENINGS & DETAILS NOT SHOWN ON THESE STRUCTURAL DRAWINGS.
ALL DIMENSIONS SHALL BE CHECKED & COORDINATED BY THE CONTRACTOR.

DESIGN CRITERIA:

BUILDING CODE:
2018 KENTUCKY BUILDING CODE AND 2015 INTERNATIONAL BUILDING CODE (IBC)
SEE S-002 FOR STORM SHELTER SPECIFIC DESIGN CRITERIA.

DEAD LOADS:

TRUSSES:	
TOP CHORD	10PSF
BOTTOM CHORD	10PSF
LIVE LOADS:	
ROOFS	20 PSF
SNOW LOAD:	
GROUND SNOW LOAD (P g)	15 PSF
SNOW EXPOSURE FACTOR (Ce)	1.0
THERMAL FACTOR (C t)	1.0
SNOW LOAD IMPORTANCE FACTOR (I s)	1.1
FLAT ROOF SNOW LOAD, Pf = 0.7 CeCt Is Pg	11.6 PSF
WIND LOAD:	
ULTIMATE DESIGN WIND SPEED	120 MPH
RICK CATEGORY	II
EXPOSURE CATEGORY	C
INTERNAL PRESSURE COEFFICIENT (GCpi)	±0.18
COMPONENTS AND CLADDING WIND PRESSURE	±23PSF
SEISMIC LOAD:	
RISK CATEGORY	II
SEISMIC IMPORTANCE FACTOR (Ie)	1.0
MAPPED SPECTRAL RESPONSE ACCELERATION PARAMETERS:	
Ss	0.20
S1	0.106
SITE CLASS	D
DESIGN SPECTRAL ACCELERATION PARAMETERS:	
SDs	0.213
SD1	0.169
SEISMIC DESIGN CATEGORY	C
BASIC SEISMIC – FORCE – RESISTING SYSTEM:	
ORDINARY REINFORCED MASONRY SHEAR WALLS	
RESPONSE MODIFICATIONS COEFFICIENT (R):	3
ANALYSIS PROCEDURE: EQUIVALENT LATERAL FORCE	

FOUNDATION NOTES:

1. SPREAD AND STRIP FOOTINGS HAVE BEEN DESIGNED FOR AN ASSUMED SOIL BEARING PRESSURE OF 2,000 PSF AT 30 INCHES BELOW GRADE.

2. FOOTINGS SHALL BE CENTERED UNDER COLUMNS AND WALLS UNLESS SPECIFICALLY DETAILED OTHERWISE ON THE DRAWINGS.

3. PROTECT EXISTING UTILITIES AND STRUCTURES, OVERHEAD OR UNDERGROUND, IN WORK AREA.

4. FOOTINGS SHALL BE STEPPED/DROPPED AT UNDERGROUND PIPING AS REQUIRED. COORDINATE WITH PLUMBING WORK FOR REQUIRED STEP/DROP LOCATIONS.

6. FOOTINGS SHALL NOT BE PLACED ONTO OR AGAINST SUBGRADES CONTAINING FREE WATER, FROST OR ICE. CONTRACTOR SHALL FURNISH ALL REQUIRED DEWATERING EQUIPMENT TO MAINTAIN A DRY EXCAVATION UNTIL BACKFILL IS COMPLETE.

CONCRETE NOTES:

1. CONCRETE STRENGTH – PROVIDE CONCRETE WITH THE FOLLOWING STRENGTHS AT THE LOCATIONS NOTED. MIX DESIGN, SLUMP, AIR ENTRAINMENT, AGGREGATE SIZE, ETC., SHALL BE IN CONFORMANCE WITH THE A.C.I. CODE, LATEST EDITION.

LOCATION	STRENGTH (PSI @ 28 DAYS)
SPREAD FOOTINGS AND FOUNDATIONS, SLAB ON GRADE,	4,000 PSI NORMAL WEIGHT

2. REINFORCING STEEL – ASTM A615 GRADE 60 (UNLESS WELDED).

3. WELDING OF REINFORCING STEEL SHALL CONFORM TO AWS D12–1 USING PROPER LOW HYDROGEN ELECTRODES. ALL BARS TO BE WELDED SHALL CONFORM TO ASTM A706.

4. FABRICATE AND PLACE REINFORCEMENT IN ACCORDANCE WITH ACI PUBLICATION SP–66, ACI DETAILING MANUAL – LATEST EDITION.

5. ALL CONCRETE WORK SHALL CONFORM TO THE LATEST EDITION OF THE AMERICAN CONCRETE INSTITUTE PUBLICATIONS: ACI 301, ACI 311, ACI 315, ACI 318, ACI 347, ACI 304. ALL CONCRETE SHALL BE MECHANICALLY VIBRATED.

6. CONCRETE COVER FOR REINFORCEMENT FOR NON–PRESTRESSED, CAST IN PLACE CONCRETE SHALL BE AS FOLLOWS:

CONDITION	COVER
CAST AGAINST EARTH	3"
EXPOSED TO WEATHER	
#5 & SMALLER	1 1/2"
#6 & LARGER	2"
SLAB–ON–GRADE	2"

7. EMBEDS – ALL ITEMS TO BE CAST INTO CONCRETE SUCH AS REINFORCING DOWELS, BOLTS, ANCHORS, PIPES, SLEEVES, ETC., SHALL BE SECURELY AND ACCURATELY POSITIONED INTO THE FORMS PRIOR TO PLACING THE CONCRETE.

8. CONSTRUCTION JOINTS – THE CONTRACTOR SHALL OBTAIN THE ENGINEER'S APPROVAL FOR CONCRETE CONSTRUCTION JOINT LOCATIONS. REINFORCING STEEL DETAILING MAY CHANGE AND THE CONTRACTOR MAY BE RESPONSIBLE FOR ADDITIONAL EXPENSES AS A RESULT.

9. ALL FIELD BENDING OF REINFORCING SHALL BE DONE COLD. HEATING OF BARS WILL NOT BE PERMITTED.

10. THE CONTRACTOR SHALL PREPARE AND SUBMIT REINFORCEMENT SHOP DRAWINGS TO THE ENGINEER FOR REVIEW PRIOR TO FABRICATION. THE SHOP DRAWINGS SHALL CLEARLY SHOW ALL REINFORCEMENT LENGTHS AND BENDS, LOCATIONS OF ALL BARS, METHODS OF SUPPORT, DETAILS OF PLACEMENT AND PLACEMENT COORDINATION WITH FORM–WORK, EMBEDMENTS, CONCRETE VIBRATION AND CONSTRUCTION JOINTS.

CONCRETE MASONRY GENERAL NOTES:

1. PROVIDE VERTICAL REINFORCEMENT AS FOLLOWS:
   8" CMU WALLS #5 @ 32" O.C.
   PROVIDE 2) #5 VERTICAL REINFORCEMENT AT JAMBS OF EACH OPENING, AT BOTH SIDES OF CONTROL JOINT; AND AT EACH END OR CORNER OF WALL, UNLESS SHOWN OTHERWISE.

2. PROVIDE HORIZONTAL REINFORCEMENT AS FOLLOWS:
   BOND BEAMS: BOND BEAM REINFORCING TO BE 2) #5 REBAR AT SPACING NOT TO EXCEED 8 FT
   PROVIDE ADDITIONAL BOND BEAMS AT TOP & BOTTOM OF DOOR OPENINGS.
   ALL CMU WALLS: LADDER TYPE W1.7 (9 GA.) GALVANIZED WELDED WIRE JOINT REINF. @ 16" O.C.

   PROVIDE 90° HOOKS FOR ALL BOND BEAM REINFORCING BARS AT CORNERS.

3. GROUT ALL BELOW GRADE CORES SOLID.

4. CONSTRUCT MASONRY IN RUNNING BOND ONLY, UNLESS NOTED OTHERWISE.

5. PROVIDE VERTICAL CONTROL JOINTS WHERE SHOWN. IF NOT SHOWN, PROVIDE CONTROL JOINTS AT SPACING NOT TO EXCEED 40 FT., SO AS NOT TO REDUCE THE OVERALL STRENGTH AND STABILITY OF THE WALL. SUBMIT DRAWINGS INDICATING LOCATIONS AND CONSTRUCTION OF JOINTS FOR ARCHITECT'S REVIEW.

6. THE MASONRY WORK HAS BEEN DESIGNED AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE "BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES" (ACI 530/ASCE 5/TMS 402).

7. ALL CMU SHALL BE LIGHTWEIGHT, CONFORMING TO ASTM C90, GRADE N, WITH MINIMUM AVERAGE NET AREA COMPRESSIVE STRENGTH OF 3,250 PSI (f'm=2,500 PSI) BUT NOT LESS THAN, UNLESS NOTED OTHERWISE. SEE S–002 FOR STORM SHELTER WALL REQUIREMENTS.

8. USE TYPE OF MORTAR IN CONJUNCTION WITH THE TYPE OF CMU TO PRODUCE REQUIRED MASONRY COMPRESSIVE STRENGTH, AND CONFORMING TO ASTM C270.

9. THE REINFORCEMENT SHALL CONFORM TO THE LATEST EDITION OF THE FOLLOWING SPECIFICATIONS:
   REBAR ASTM A615 GRADE 60
   GALVANIZED CARBON STEEL WIRE ASTM A82

10. GROUT REINFORCED MASONRY WITH LOW RISE METHOD ONLY. GROUT SHALL CONFORM TO ASTM C476 AND SHALL HAVE MINIMUM COMPRESSIVE STRENGTH OF 2500 PSI @ 28 DAYS. LIFTS OF GROUT SHALL BE KEYED 2 INCHES INTO THE PREVIOUS COURSE OF MASONRY BELOW.
    MORTAR SHALL NOT BE USED IN PLACE OF GROUT

11. POURABLE CONSISTENCY GROUT SHALL BE USED TO FILL ANY REQUIRED CAVITIES AT BEAM, JOIST AND METAL DECK BEARING COURSES, AT VERTICAL FILL OF HOLLOW CELLS, BOND BEAMS, REINFORCED MASONRY BEAMS, PIERS AND COLUMNS. VERTICAL CELLS CONTAINING REINFORCING AND GROUT SHALL FORM A CONTINUOUS CAVITY, FREE OF MORTAR DROPPINGS.

12. WALLS SHALL BE STEPPED/DROPPED AT UNDERGROUND PIPING AS REQUIRED. COORDINATE WITH FOUNDATION AND PLUMBING WORK FOR REQUIRED STEP/DROP LOCATIONS.

EPOXY NOTES:

1. ALL REINFORCING DOWELS OR THREADED ROD DOWELS INDICATED IN THE CONSTRUCTION DOCUMENTS TO BE "SET INTO HOLES FILLED WITH EPOXY ADHESIVE" SHALL BE GOVERNED BY THE PROVISIONS THIS SECTION AS WELL AS THE SPECIFIC INSTALLATION PROVISIONS REQUIRED BY THE PRODUCT MANUFACTURER AND APPLICABLE I.C.B.O. EVALUATION REPORT REQUIREMENTS.

2. ACCEPTABLE PRODUCTS ARE AS FOLLOWS:

   THE GENERAL CONTRACTOR SHALL SUBMIT TO THE STRUCTURAL ENGINEER THE EPOXY PRODUCT NAME TO BE USED ALONG WITH IT'S I.C.B.O. REPORT & TESTING REQUIREMENTS.

   ADHESIVE ANCHORS FOR CONCRETE AND MASONRY AS PROVIDED BY SIMPSON STRONG–TIE
   CONTACT SIMPSON AT (800) 999–5099 FOR PRODUCT RELATED QUESTIONS.

   FOR ANCHORING IN TO CRACKED AND UNCRACKED CONCRETE
   A. ADHESIVE ANCHORS SHALL HAVE BEEN TESTED IN ACCORDANCE WITH ACI 355.4 AND/OR ICC–ES AC308 FOR CRACKED CONCRETE AND SEISMIC APPLICATIONS. ADHESIVE ANCHORS SHALL BE INSTALLED BY A CERTIFIED ADHESIVE ANCHOR INSTALLER WHERE DESIGNATED ON THE CONTRACT DOCUMENTS. PRE–APPROVED PRODUCTS INCLUDE:
      1. SIMPSON STRONG–TIE "SET–XP" (ICC–ES ESR–2508)

   FOR ANCHORING IN TO GROUT–FILLED CONCRETE MASONRY UNITS
   A. ADHESIVE ANCHORS SHALL HAVE BEEN TESTED IN ACCORDANCE WITH ICC–ES AC58. PRE–APPROVED PRODUCTS INCLUDE:
      1. SIMPSON STRONG–TIE "SET–XP" (IAPMO–UES ER–265)

3. PROVIDE DRILLED HOLES OF DIAMETER AND DEPTH SPECIFIED BY THE PRODUCT MANUFACTURER FOR THE DOWEL SIZE SPECIFIED IN THE CONSTRUCTION DOCUMENTS OR THE DIAMETER AND DEPTH SPECIFIED IN THE CONTRACT DOCUMENTS, WHICHEVER IS GREATER WHEN DEPTH OF EMBEDMENT IS CONSIDERED.

4. INSTALL ANCHORS PER THE MANUFACTURER INSTRUCTIONS, AS INCLUDED IN THE ANCHOR PACKAGING.

5. THE CONTRACTOR SHALL ARRANGE AN ANCHOR MANUFACTURER'S REPRESENTATIVE TO PROVIDE ONSITE INSTALLATION TRAINING FOR ALL OF THEIR ANCHORING PRODUCTS SPECIFIED. THE STRUCTURAL ENGINEER OF RECORD MUST RECEIVE DOCUMENTED CONFIRMATION THAT ALL OF THE CONTRACTOR 'S PERSONNEL WHO INSTALL ANCHORS ARE TRAINED PRIOR TO THE COMMENCEMENT OF INSTALLING ANCHORS.

6. ANCHOR CAPACITY IS DEPENDANT UPON SPACING BETWEEN ADJACENT ANCHORS AND PROXIMITY OF ANCHORS TO EDGE OF CONCRETE. INSTALL ANCHORS IN ACCORDANCE WITH SPACING AND EDGE CLEARANCES INDICATED ON THE DRAWINGS.

7. EXISTING REINFORCING BARS IN THE CONCRETE STRUCTURE MAY CONFLICT WITH SPECIFIC ANCHOR LOCATIONS. UNLESS NOTED ON THE DRAWINGS THAT THE BARS CAN BE CUT, THE CONTRACTOR SHALL REVIEW THE EXISTING STRUCTURAL DRAWINGS AND SHALL UNDERTAKE TO LOCATE THE POSITION OF THE REINFORCING BARS AT THE LOCATIONS OF THE CONCRETE ANCHORS, BY HILTI FERROSCAN, GPR, X–RAY, OR OTHER MEANS.

HIGH STRENGTH NON-SHRINK GROUT NOTES:

NON–SHRINK GROUT SHALL BE NON–FERROUS, NON–SHRINK GROUT WITH A STRENGTH OF 10,000 PSI MINIMUM MANUFACTURED BY MASTER BUILDERS (NSGROUT), OR EQUAL. SURFACE OR EXISTING CONCRETE SHALL BE FREE FROM DUST, DEBRIS OR WATER PRIOR TO PLACING GROUT. GROUT PRODUCT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S WRITTEN RECOMMENDATIONS. GROUT MUST BE PLACED IMMEDIATELY AFTER COLUMN IS PLUMB, AND BEFORE ANY DECKING IS PLACED.

DELEGATED DESIGN OF BUILDING COMPONENTS:

1. DESIGN OF CERTAIN BUILDING COMPONENTS THAT ARE NOT CONSIDERED PART OF THE PRIMARY STRUCTURAL SYSTEM IS DELEGATED TO BE COMPLETED BY A SPECIALTY STRUCTURAL ENGINEER RETAINED BY THE CONTRACTOR. THESE COMPONENTS MAY INCLUDE BUT ARE NOT LIMITED TO, PREENGINEERED PAVILION STRUCTURE, PREENGINEERED TRUSSES, ARCHITECTURAL AND STRUCTURAL HEAVY TIMBER, AND HEAVY TIMBER DECKING. THE DESIGN SHALL INCLUDE THE CONNECTIONS TO THE PRIMARY BUILDING FRAME WHERE APPLICABLE.

2. THE SPECIALTY STRUCTURAL ENGINEER SHALL DESIGN THE COMPONENT(S) AND ASSOCIATED CONNECTIONS, FOR THE LOADS AND DEFLECTION REQUIREMENTS INDICATED. THE REVIEW OF THE SHOP DRAWING SUBMITTAL BY THE STRUCTURAL ENGINEER SHALL ONLY BE TO VERIFY COMPLIANCE WITH DESIGN INTENT, APPLICATION OF LOADS SPECIFIED, AND REVIEW OF THE PRIMARY BUILDING FRAME TO RESIST THE LOADS IMPOSED BY THE COMPONENT CONNECTIONS.

WOOD TRUSS NOTES:

1. THE DESIGN OF THE ROOF TRUSS SYSTEM, BRACING, ETC. IS THE SOLE RESPONSIBILITY OF THE TRUSS MANUFACTURER USING THE BEARING LOCATIONS IDENTIFIED. ANY DEVIATION FROM THE BEARING LOCATIONS SHOWN SHALL BE APPROVED BY THE EOR PRIOR TO SUBMITTAL OF THE SHOP DRAWINGS.

2. THE TRUSS MANUFACTURER SHALL SUBMIT SHOP DRAWINGS AND CALCULATIONS FOR EOR'S REVIEW PRIOR TO TRUSS FABRICATION INCLUDING TRUSS DESIGN AND LAYOUT ALONG WITH ANY DETAILING REQUIRED FOR BRACING, TRUSS CONNECTIONS OR CONNECTIONS TO THE STRUCTURE.

3. ALL TRUSS DIMENSIONS SHALL BE FIELD VERIFIED PRIOR TO FABRICATION.

4. NO. 3 GRADE LUMBER IS NOT PERMITTED IN THE FABRICATED TRUSS.

5. THE TRUSS FABRICATOR SHALL SUBMIT A CERTIFICATE OF COMPLIANCE TO THE EOR STATING THAT THE WORK WAS PERFORMED IN ACCORDANCE WITH THE APPROVED CONSTRUCTION DOCUMENTS AND SHALL ADDRESS THE FOLLOWING AS A MINIMUM:
   A. QUALITY CONTROL PROCEDURES FOR PLACEMENT AND ALIGNMENT OF GUSSETS
   B. QUALITY CONTROL PROCEDURES FOR PLACEMENT OF MEMBERS
   C. QUALITY CONTROL PROCEDURES FOR FIELD IDENTIFICATIONS AND FIELD INSTALLATIONS

6. PERMANENT BRACING SHALL BE PROVIDED IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

7. WHERE CONNECTIONS ARE REQUIRED BUT HAVE NOT BEEN SPECIFIED ON THE STRUCTURAL DRAWINGS OR TRUSS MANUFACTURER'S SHOP DRAWINGS, CONTACT THE STRUCTURAL EOR FOR APPROPRIATE CONNECTORS TO UTILIZE.

8. THE SPECIAL INSPECTOR SHALL VERIFY THAT THE PERMANENT INDIVIDUAL TRUSS MEMBER RESTRAINT/BRACING IS INSTALLED IN ACCORDANCE WITH THE APPROVED TRUSS SUBMITTAL PACKAGE.

SHOP DRAWINGS:

SHOP DRAWINGS ARE AN AID FOR FIELD PLACEMENT AND ARE SUPERSEDED BY THE STRUCTURAL DRAWINGS. ANY REVIEW OF SHOP DRAWINGS BY THIS OFFICE IS ONLY FOR GENERAL CONFORMANCE TO THE STRUCTURAL REQUIREMENTS AND IN NO WAY GUARANTEES THE ACCURACY OR COMPLETENESS OF INFORMATION THEREON. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO INSURE ALL CONSTRUCTION IS IN FULL COMPLIANCE WITH THE LATEST SET OF STRUCTURAL DRAWINGS. SHOP DRAWINGS PREPARED BY SUPPLIERS, SUBCONTRACTORS, ETC. SHALL BE REVIEWED AND COORDINATED BY THE CONTRACTOR, PRIOR TO SUBMITTING TO THE ENGINEER. SHOP DRAWINGS MAY NOT BE BASED ON CONTRACT DRAWINGS. ALL SHOP DRAWINGS WHICH HAVE NOT BEEN PREPARED FROM SCRATCH WILL BE REJECTED. SUBMIT ELECTRONIC COPY FOR REVIEW. REVIEW SET WILL BE RETURNED WITH ANY COMMENTS ELECTRONICALLY IN PDF FORM.

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REGISTERED
No. 25415
Commonwealth of
KENTUCKY
PROFESSIONAL ARCHITECT
21 DECEMBER 2023

STRUCTURAL NOTES

FREEMAN LAKE PARK - SHELTERS PROJECT

FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY

CONSTRUCTION DOCUMENTS

Issue Date:	December 22, 2023
Drawn By:	JMT
Checked By:	BP

Revisions:

Mark	Date
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AHJ SEAL

Project Number
21049.05

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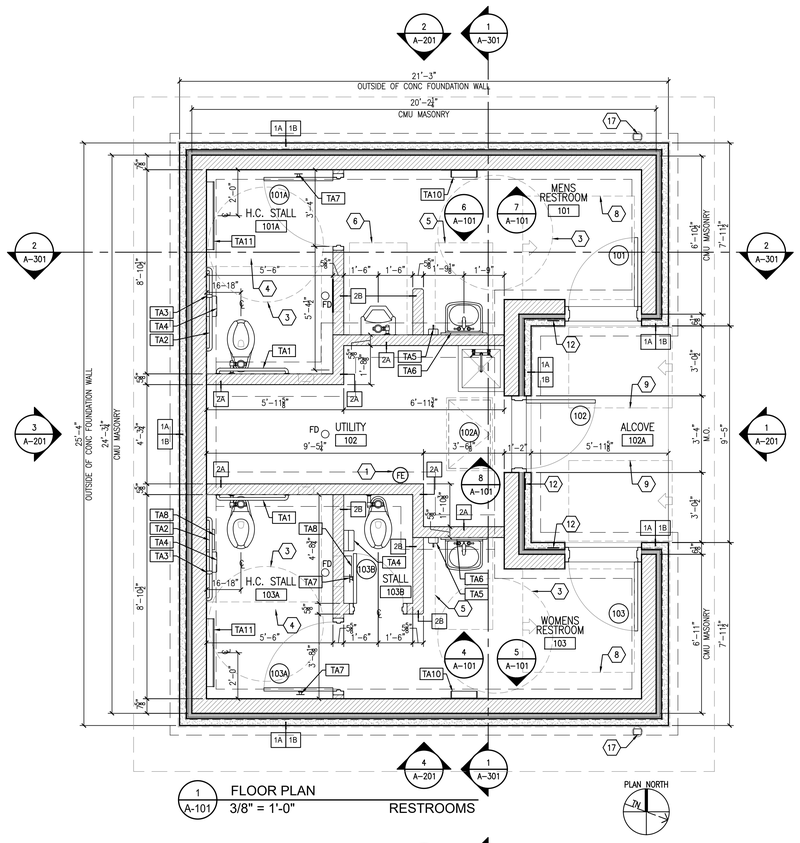
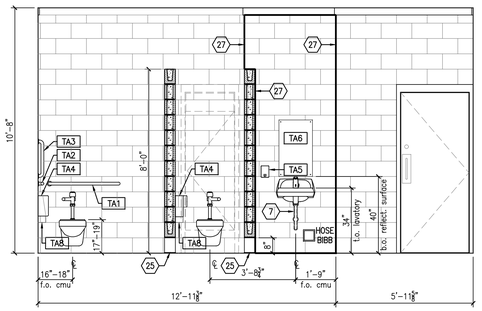
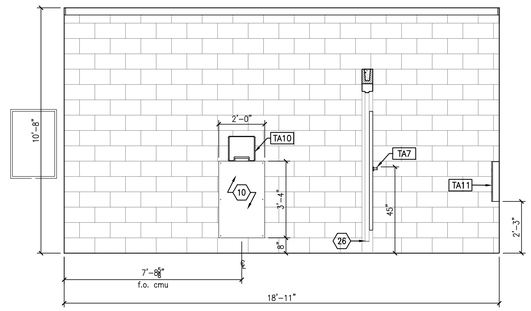
A-002



1 A-101 FLOOR PLAN 3/8" = 1'-0" RESTROOMS



4 A-101 INTERIOR ELEVATION 3/8" = 1'-0" WOMENS RR 103



5 A-101 INTERIOR ELEVATION 3/8" = 1'-0" WOMENS RR 103

Toilet / Custodial Accessories Schedule

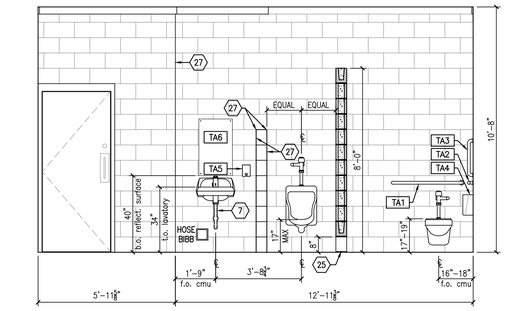
TAG	DESCRIPTION	MOUNTING HEIGHT AFF UNLESS OTHERWISE NOTED	TOILET ACCESSORY MOUNTING DIAGRAM (SEE SHEET A-001)	MOUNTING TYPE: SURFACE	MOUNTING TYPE: SEMI-RECESSED	MOUNTING TYPE: RECESSED	TOILET ACCESSORIES SCHEDULE REMARKS
TA1	36" GRAB BAR (HORIZONTAL)	34" AFF TO CL	1,2	●	–	–	–
TA2	42" GRAB BAR (HORIZONTAL)	34" AFF TO CL	1,2	●	–	–	–
TA3	18" GRAB BAR (VERTICAL)	58" AFF TO TOP	1,2	●	–	–	–
TA4	TOILET PAPER DISPENSER	SEE DIAGRAM	2	●	–	–	–
TA5	SOAP DISPENSER	SEE DIAGRAM	2	●	–	–	–
TA6	MIRROR 18"X36"	SEE DIAGRAM	2	●	–	–	–
TA7	DOUBLE ROBE HOOK	SEE DIAGRAM	6	●	–	–	1
TA8	SANITARY NAPKIN DISPOSAL	SEE DIAGRAM	2	●	–	–	–
TA9	NOT USED	–	–	–	–	–	–
TA10	ELECTRIC HAND DRYER	PER ADA	–	●	–	–	–
TA11	BABY CHANGING STATION	PER ADA	–	●	–	–	–
TA12	MOP & BROOM HOLDER	SEE DIAGRAM	3	●	–	–	2

GENERAL:

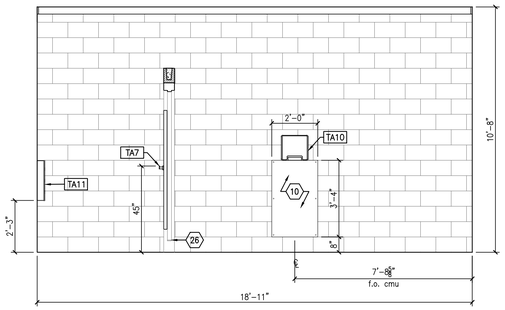
1. REFER TO SPECIFICATION SECTION 102810 FOR TOILET ACCESSORY MANUFACTURER AND MODEL NUMBER INFORMATION
2. EXAMINE SUBSTRATES AND AREAS, WITH INSTALLER PRESENT, FOR COMPLIANCE WITH REQUIREMENTS FOR INSTALLATION TOLERANCES AND OTHER CONDITIONS AFFECTING PERFORMANCE OF THE WORK. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

REMARKS:

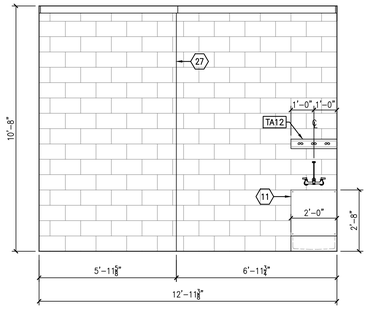
1. INSTALL DOUBLE ROBE HOOK CENTERED ON INSIDE OF STALL DOOR
2. REFER TO DRAWING 8/A-101 FOR MOUNTING HEIGHT OF MOP/BROOM HOLDER



6 A-101 INTERIOR ELEVATION 3/8" = 1'-0" MENS RR 101



7 A-101 INTERIOR ELEVATION 3/8" = 1'-0" MENS RR 101



8 A-101 INTERIOR ELEVATION 3/8" = 1'-0"

GENERAL NOTES

A. ALL PENETRATIONS THROUGH THE CONCRETE SLAB ON GRADE TO BE SEALED TO PREVENT AIR AND WATER INFILTRATION, TYP

B. REFER TO SHT A-001 FOR TOILET ACCESSORIES MOUNTING HEIGHTS AND WALL TYPE SCHEDULE, TYP

C. LAYOUT DIMENSIONS TO CENTERLINE OF PLUMBING FIXTURES ARE FROM FACE OF CMU

D. REFER TO SPECIFICATION SECTION 102810 FOR TOILET ACCESSORY MANUFACTURER AND MODEL NUMBER INFORMATION

E. REFER TO SIGNAGE SPECIFICATION FOR ADDITIONAL SIGNAGE INFORMATION

F. SEE ENLARGED PLANS AND INTERIOR ELEVATIONS FOR ADDITIONAL EQUIPMENT ITEMS NOT SHOWN ON THE FLOOR PLANS

G. DO NOT DETERMINE DIMENSIONS AND SIZE OF THE GRAPHIC REPRESENTATIONS SHOWN ON THE DRAWINGS BY USING MEASURING DEVICES (DO NOT SCALE), RELY ON THE NUMERIC DIMENSIONS SHOWN ON THE DRAWINGS FOR MEASUREMENT.

H. REFER TO SHEET A-302 FOR FINISH SCHEDULE FOR FIELD APPLIED FINISHES OF FLOOR, WALLS, CEILING, ALL EXPOSED METALS, GYPSUM BOARD, AND OTHER MATERIALS AND SURFACES.

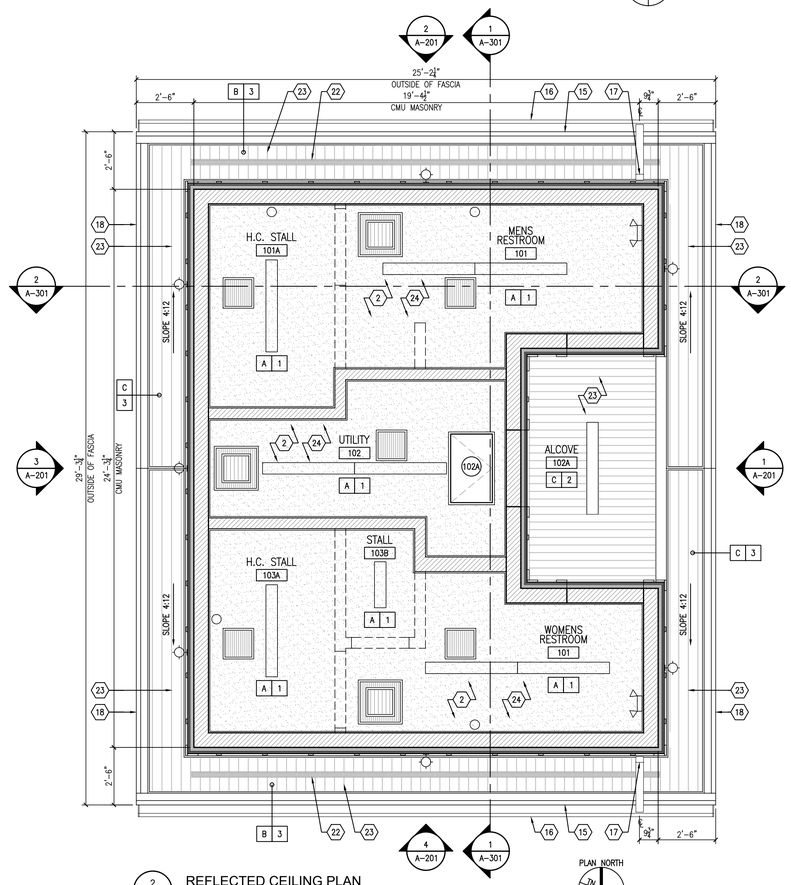
I. REFER TO MECHANICAL, ELECTRICAL, AND PLUMBING DRAWINGS AND SPECIFICATIONS FOR FIXTURE, UTILITY SERVICES, AND MECHANICAL / ELECTRICAL SYSTEMS NEW CONSTRUCTION INFORMATION

J. COORDINATE UTILITY SHUT DOWNS WITH OWNER IN ADVANCE IN TIME FRAME STATED DURING THE PRECONSTRUCTION MEETING

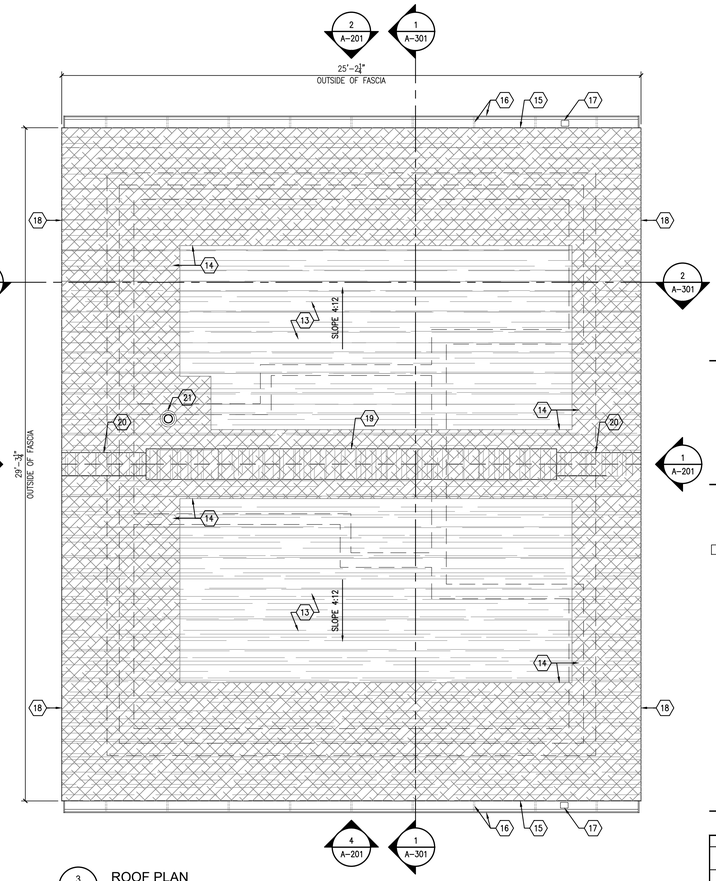
K. REFER TO SHEET A-001 FOR STRUCTURAL NOTES

SHEET KEYNOTES ⬡

1. MULTIPURPOSE DRY-CHEMICAL FIRE EXTINGUISHER W/ STEEL MTG BRACKET AND VERTICAL "FIRE EXTINGUISHER" IDENTIFICATION DECAL – SEE SPEC SECTION 104413
2. SUSPENDED GYPSUM BOARD 5/8" ABUSE RESISTANT CEILING OVER 7/8" HAT CHANNELS SPACED @ 24" OC – SEE SPEC
3. 60" DIAMETER ACCESSIBLE FLOOR CLEARANCE TURNING AREA
4. 60"(W) X 56"(D) ACCESSIBLE WATER CLOSET FIXTURE FLOOR CLEARANCE
5. 30"(W) X 48"(D) ACCESSIBLE LAVATORY FIXTURE FLOOR CLEARANCE
6. 30"(W) X 48"(D) ACCESSIBLE URINAL FIXTURE FLOOR CLEARANCE
7. COVER ALL EXPOSED PIPING/TRAP UNDER LAVATORIES – SEE PLUMBING DWG'S AND SPEC'S
8. 48"(D) ACCESSIBLE DOOR CLEARANCE W/ 24" CLEARANCE @ LATCH JAMB
9. 42"(D) ACCESSIBLE DOOR CLEARANCE W/ 22" CLEARANCE @ HINGE JAMB
10. 24"X40" STAINLESS STEEL WALL PROTECTION PANEL W/ HEMMED EDGES – INSTALL W/ CONSTRUCTION ADHESIVE AND MECHANICAL FASTENERS
11. 24"X24" STAINLESS STEEL WALL PROTECTION PANEL W/ HEMMED EDGES – INSTALL W/ CONSTRUCTION ADHESIVE AND MECHANICAL FASTENERS
12. 6"(W)X9"(H) ADA COMPLIANT ROOM SIGNAGE – REFER TO SIGNAGE ON SHT A-302
13. ARCHITECTURAL ASPHALT SHINGLE OVER (1) LAYER OF #30 FELT
14. CONTINUOUS SELF-ADHERING ICE AND WATER SHEET UNDERLAYMENT
15. CONTINUOUS PREFINISHED METAL FASCIA OVER 2X TREATED WOOD VERTICAL FASCIA BOARD AND 3/4" EXTERIOR GRADE FINISH PLYWOOD – PROVIDE CONCEALED ANCHORS – COLOR TO BE SELECTED BY OWNER
16. CONT PREFINISHED METAL GUTTER WITH SUPPORT BRACKETS SPACED @ 32" OC MIN
17. 4"(SQ) PREFINISHED METAL DOWNSPOUT W/ COLOR MATCHED ANCHOR STRAPS SPACED PER MANF RECOMMENDATIONS. CONNECT DOWNSPOUT TO SUBSURFACE DRAINAGE PIPING – REFER TO CIVIL DWG'S AND SPEC'S
18. CONTINUOUS PREFINISHED METAL RAKE EDGE OVER 2X TREATED WOOD VERTICAL FASCIA BOARD AND 3/4" EXTERIOR GRADE FINISH PLYWOOD – PROVIDE CONCEALED ANCHORS – COLOR TO BE SELECTED BY OWNER
19. ARCHITECTURAL ASPHALT SHINGLE RIDGE VENT – SEE DETAIL 8/A-301
20. ARCHITECTURAL ASPHALT SHINGLE RIDGE CAP – SEE DETAIL 7/A-502
21. PROVIDE PIPE BOOT AND SELF-ADHERING ICE AND WATER SHEET AT PERIMETER OF PIPE PENETRATION – SEE DETAIL A-301 FOR SPECIFIC ROOF SYSTEM TYPE @ PENETRATION. INSTALL BOOT PER MANF'S RECOMMENDATIONS.
22. CONT ALUMINUM LOUVERED SOFFIT VENT W/ MIN 9 SQ INCHES OF NET FREE AREA PER LINEAR FOOT
23. 'KNOTWOOD' WOODGRAIN LOOK ALUM SOFFIT SYSTEM W/ FASTENERS AND CONT FINISHING ANGLES – COORDINATE INSTALLATION DIRECTION W/ PAVILION
24. 32"(H) FIBER CEMENT CEILING TRIM BOARD AT PERIMETER OF ROOM – TYP
25. 6" BOND BEAM OVER 8"(H)X16"(W) OPENING @ BASE OF TOILET PARTITION – SEE DETAILS 3 & 4/A-102
26. PROVIDE 45 DEG SANITARY STOP 6" AFF @ HOLLOW METAL DOOR FRAME
27. ALL EXPOSED OUTSIDE CORNERS OF CMU FINISHED W/ BULLNOSE CMU



2 A-101 REFLECTED CEILING PLAN 3/8" = 1'-0" RESTROOMS



3 A-101 ROOF PLAN 3/8" = 1'-0" RESTROOMS

ROOF SYMBOLS LEGEND

- ARCHITECTURAL ASPHALT SHINGLE
- SELF-ADHERING ICE AND WATER SHEET UNDERLAYMENT

CEILING SYMBOLS LEGEND

- GYPSUM BOARD 5/8" ABUSE-RESISTANT CEILING AT HEIGHT A.F.F. AS SCHEDULED W/ APPLIED CEILING PAINT FINISH AS SCHEDULED.
- SURFACE MOUNT 1'-0"x4'-0" HIGH PERFORMANCE LED STRIP LIGHT FIXTURE – DAMP RATED
- SURFACE MOUNT 1'-0"x4'-0" HIGH PERFORMANCE LED STRIP LIGHT FIXTURE – DAMP RATED
- LED WALL MOUNTED EXTERIOR LIGHT FIXTURE
- LED EMERGENCY BATTERY PACK LIGHT FIXTURE
- RECESSED ELECTRIC CEILING HEATER
- MECHANICAL GRILLES & DIFFUSERS
- 'KNOTWOOD' WOODGRAIN ALUMINUM SOFFIT SYSTEM – PROVIDE VENTING AS REQ'D BY CODE

CEILING TYPE MATERIAL & HEIGHT KEY □

* APPLICABLE TO REFLECTED CEILING PLAN ONLY

	MATERIAL
A	ABUSE-RESISTANT GYP BD OVER MTL HAT CHANNELS
B	'KNOTWOOD' ALUM VENTED SOFFIT PANEL SYSTEM
C	'KNOTWOOD' ALUM PLANK SYSTEM

	HEIGHT
1	10'-8"
2	9'-4"
3	SLOPED 4:12 (SEE BLDG SECTIONS)

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BILL PICKERING REGISTERED No. 25 KENTUCKY LICENSED ARCHITECT
21 DECEMBER 2023

PLANS / INTERIOR ELEVATIONS - RESTROOMS

FREEMAN LAKE PARK - SHELTERS PROJECT

FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY

CONSTRUCTION DOCUMENTS

Issue Date:	December 22, 2023
Drawn By:	JMT
Checked By:	BP
Revisions:	
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Mark	Date

AHJ SEAL

Project Number
21049.05

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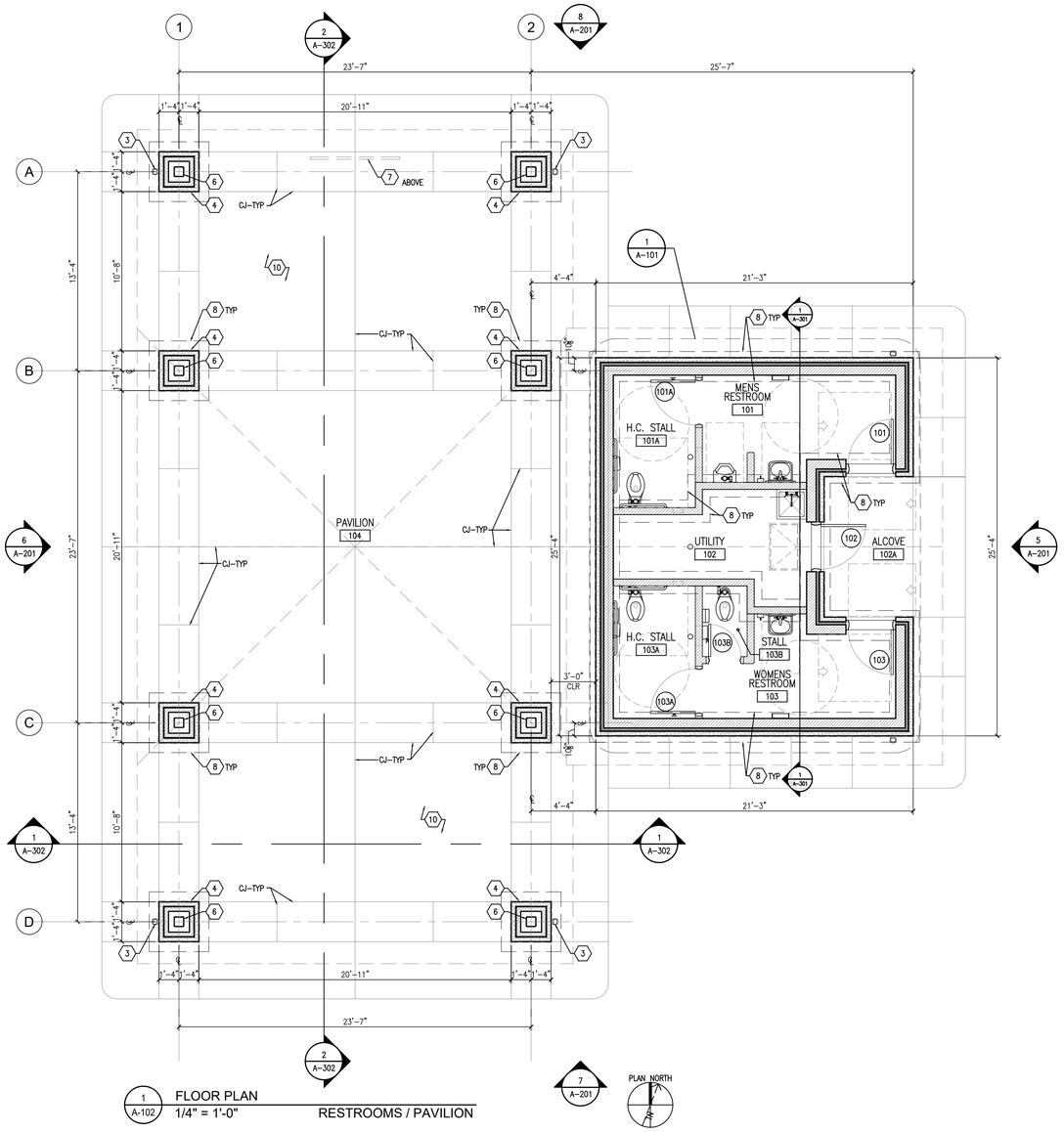
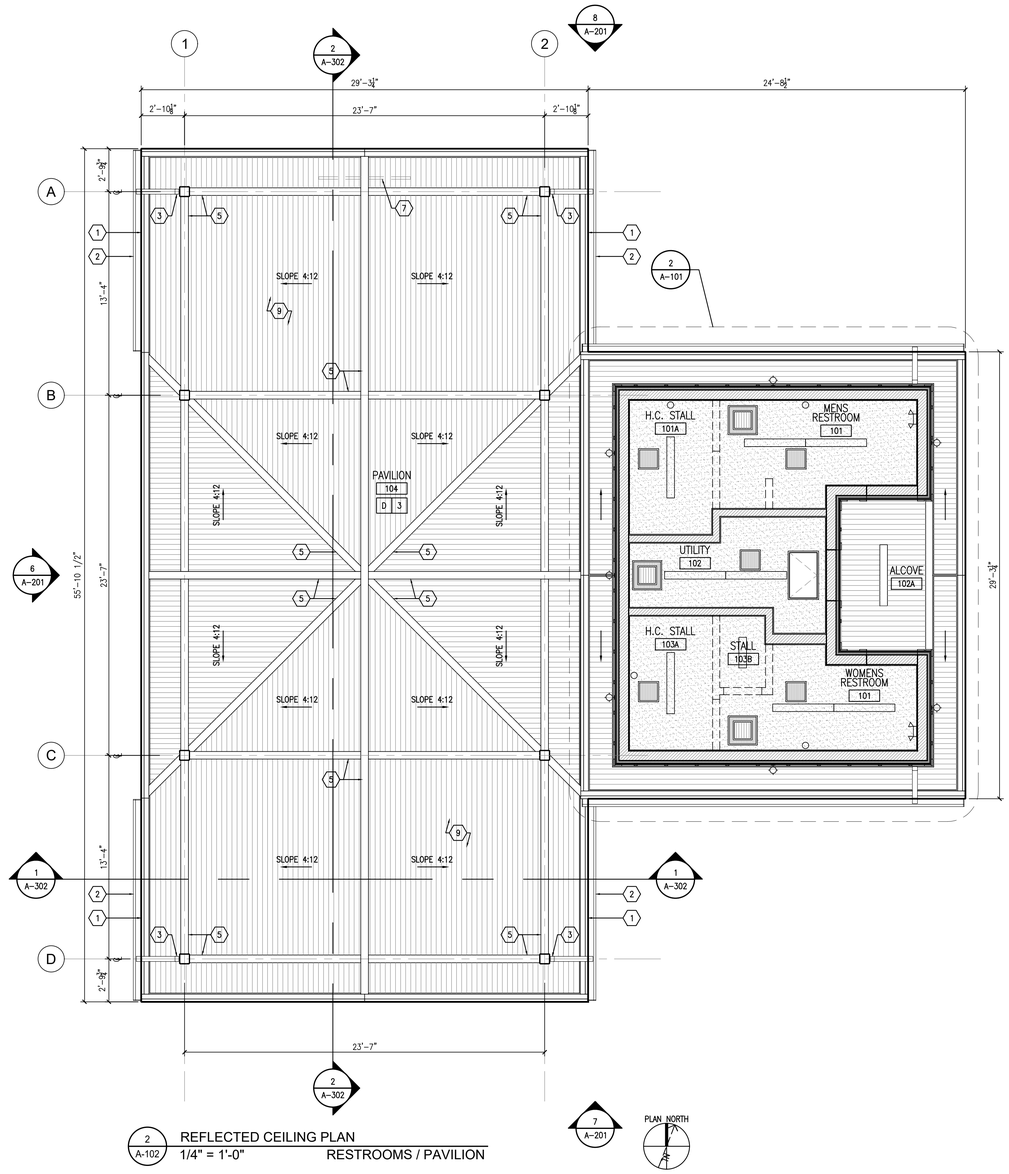
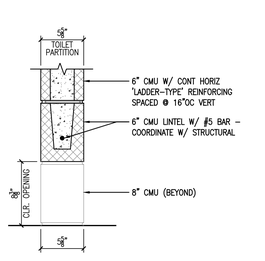
A-101



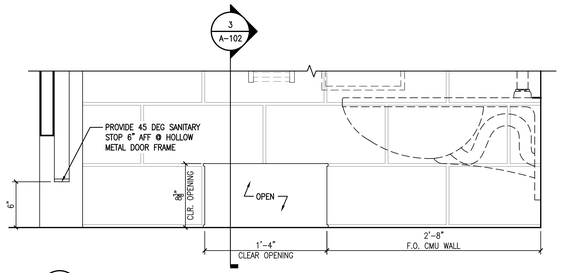
1 A-102 FLOOR PLAN
1/4" = 1'-0" RESTROOMS / PAVILION



2 A-102 REFLECTED CEILING PLAN
1/4" = 1'-0" RESTROOMS / PAVILION



3 A-102 TOILET PARTITION WALL OPENING
1 1/2" = 1'-0"



4 A-102 TOILET PARTITION WALL OPENING
1 1/2" = 1'-0"

CEILING SYMBOLS LEGEND

- GYPSUM BOARD 5/8" ABUSE-RESISTANT CEILING AT HEIGHT A.F.F. AS SCHEDULED W/ APPLIED CEILING PAINT FINISH AS SCHEDULED.
- SURFACE MOUNT 1'-0"x4'-0" HIGH PERFORMANCE LED STRIP LIGHT FIXTURE - DAMP RATED
- SURFACE MOUNT 1'-0"x4'-0" HIGH PERFORMANCE LED STRIP LIGHT FIXTURE - DAMP RATED
- LED WALL MOUNTED EXTERIOR LIGHT FIXTURE
- LED EMERGENCY BATTERY PACK LIGHT FIXTURE
- RECESSED ELECTRIC CEILING HEATER
- MECHANICAL GRILLES & DIFFUSERS
- 'KNOTWOOD' WOODGRAIN ALUMINUM SOFFIT SYSTEM - PROVIDE VENTING AS REQ'D BY CODE

CEILING TYPE MATERIAL & HEIGHT KEY ☐

* APPLICABLE TO REFLECTED CEILING PLAN ONLY

	MATERIAL
A	ABUSE-RESISTANT GYP BD OVER MTL HAT CHANNELS
B	'KNOTWOOD' ALUM VENTED SOFFIT PANEL SYSTEM
C	'KNOTWOOD' ALUM PLANK SYSTEM

	HEIGHT
1	10'-8"
2	9'-4"
3	SLOPED 4:12 (SEE BLDG SECTIONS)

GENERAL NOTES

A. REFER TO SHEET A-101 GENERAL NOTES, TYP.

SHEET KEYNOTES ⬡

1. CONTINUOUS PREFINISHED METAL FASCIA OVER 2X TREATED WOOD VERTICAL FASCIA BOARD AND ¾" TREATED PLYWOOD - PROVIDE CONCEALED ANCHORS - COLOR TO BE SELECTED BY OWNER
2. CONTINUOUS PREFINISHED METAL GUTTER WITH SUPPORT BRACKETS SPACED @ 32" OC MIN.
3. 3"X4" PREFINISHED METAL DOWNSPOUT W/ COLOR MATCHED ANCHOR STRAPS SPACED PER MANF RECOMMENDATIONS. CONNECT DOWNSPOUT TO SUBSURFACE DRAINAGE PIPING - REFER TO CIVIL DWG'S AND SPEC'S
4. CAST STONE COLUMN WRAP W/ 2-PIECE CAST STONE CAP W/ SLOPED TOP - SEE DETAILS 9/A-201 AND 10/A-201
5. PRE-ENGINEERED TUBE STEEL 'GABLE ROOF RECTANGLE' STRUCTURE - SEE SPEC SECTION 130000
6. SQUARE TS COLUMNS W/ ELECTRICAL CUTOUTS AND ACCESS POINTS - COORD QUANTITY AND LOCATIONS W/ ELECTRICAL ENGINEER
7. GABLE HANGING ORNAMENTION (CUSTOM) - 'ELIZABETHTOWN' LOGO - SEE ENLARGED PLAN. ARTWORK TEMPLATE WILL BE PROVIDED BY OWNER DURING SHOP DRAWING PHASE.
8. OUTLINE OF FOUNDATION CONCRETE FOOTING - REFER TO BUILING SECTIONS AND WALL SECTIONS
9. 'KNOTWOOD' WOODGRAIN LOOK ALUM PLANK SYSTEM W/ FASTENERS AND CONT FINISHING ANGLES
10. CONCRETE SLAB W/ TEXTURED BROOM FINISH AND HAND-TOOLED JOINTS - REFER TO CIVIL DRAWINGS FOR JOINT LOCATIONS. NOTIFY ARCHITECT OF ANY DISCREPANCIES PRIOR TO INSTALLING JOINTS

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BILL PICKERING REGISTERED No. 9915 Commonwealth of KENTUCKY ARCHITECT
21 DECEMBER 2023

FLOOR PLAN AND REFLECTED CEILING PLAN - PAVILION WITH RESTROOMS

FREEMAN LAKE PARK - SHELTERS PROJECT

FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY

CONSTRUCTION DOCUMENTS

Issue Date:	December 22, 2023
Drawn By:	JMT
Checked By:	--

Revisions:

Mark	Date
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AHJ SEAL

Project Number
21049.05

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21049.03_42X30SHT A-FP01PW A-FP01 A-RCP_PW
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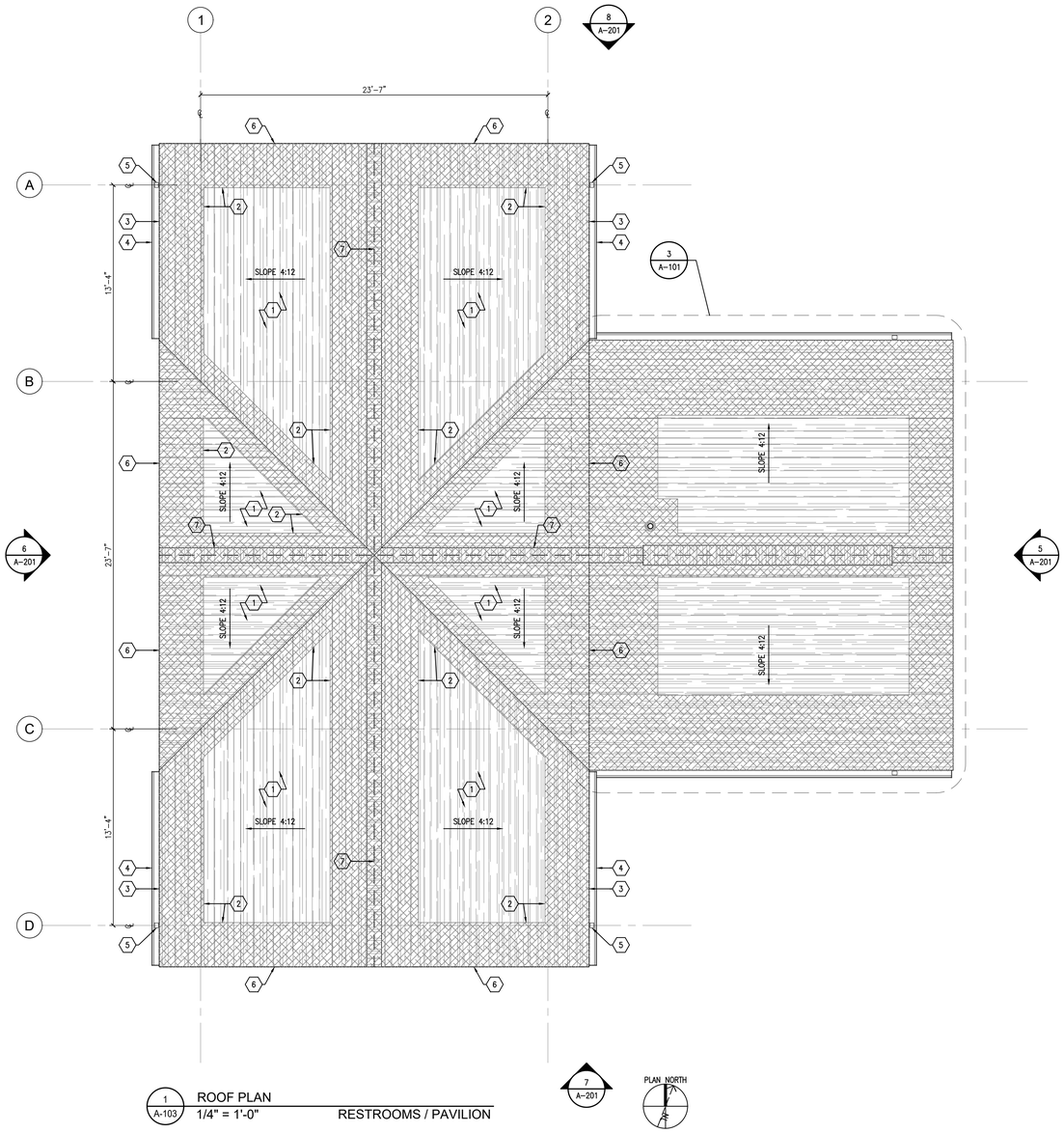
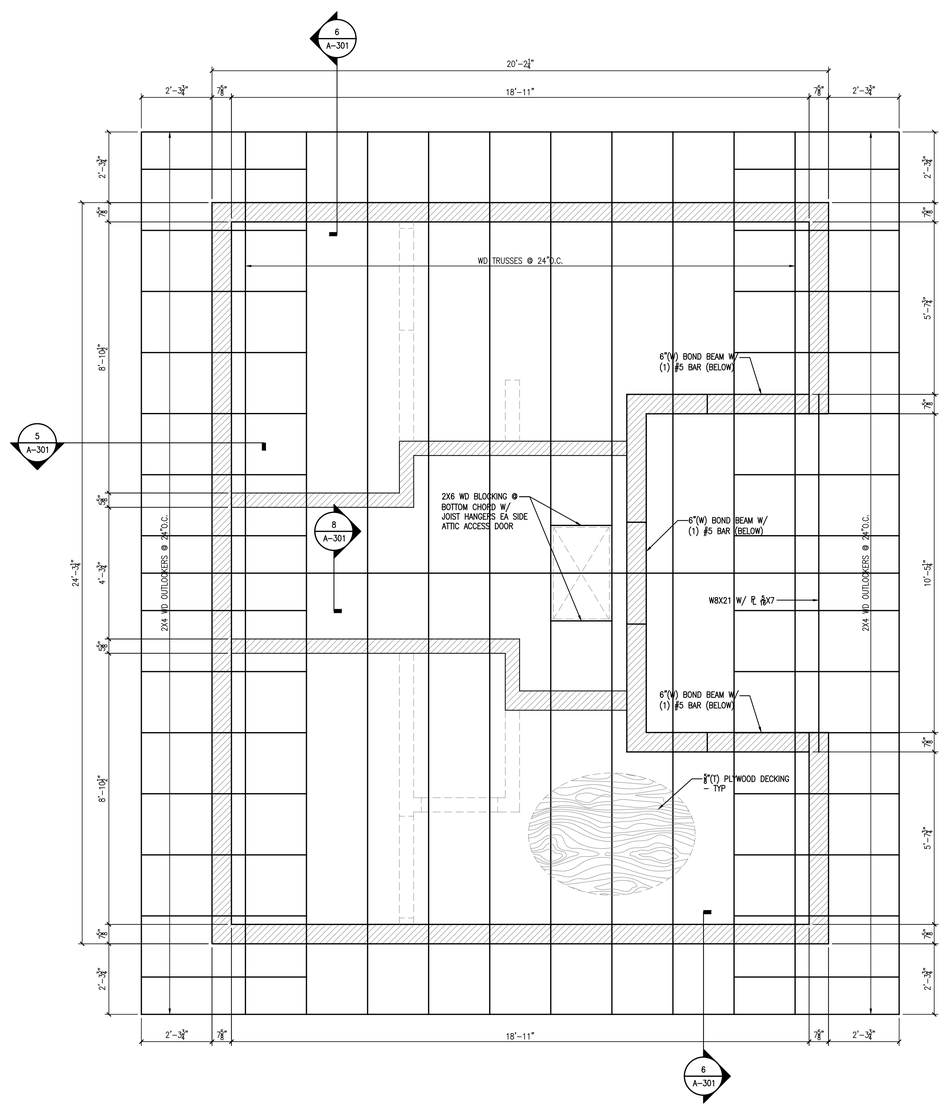


1 A-103 ROOF PLAN
1/4" = 1'-0" RESTROOMS / PAVILION



2 A-103 ROOF FRAMING PLAN
1/2" = 1'-0" RESTROOMS

GENERAL NOTES

A. REFER TO SHEET A-101 GENERAL NOTES, TYP.

SHEET KEYNOTES ⬡

1. ARCHITECTURAL ASPHALT SHINGLE OVER (1) LAYER OF #30 FELT
2. CONTINUOUS SELF-ADHERING ICE AND WATER SHEET UNDERLAYMENT
3. CONTINUOUS PREFINISHED METAL FASCIA OVER 2X EXTERIOR GRADE VERTICAL FASCIA BOARD AND ¾" EXTERIOR GRADE FINISH PLYWOOD – PROVIDE CONCEALED ANCHORS – COLOR TO BE SELECTED BY OWNER
4. CONT PREFINISHED METAL GUTTER WITH SUPPORT BRACKETS SPACED @ 32" OC MIN
5. 3"X4" PREFINISHED METAL DOWNSPOUT W/ COLOR MATCHED ANCHOR STRAPS SPACED PER MANF RECOMMENDATIONS. CONNECT DOWNSPOUT TO SUBSURFACE DRAINAGE PIPING – REFER TO CIVIL DWG'S AND SPEC'S
6. CONTINUOUS PREFINISHED METAL RAKE EDGE OVER 2X EXTERIOR GRADE VERTICAL FASCIA BOARD AND ¾" EXTERIOR GRADE FINISH PLYWOOD – PROVIDE CONCEALED ANCHORS – COLOR TO BE SELECTED BY OWNER
7. ARCHITECTURAL ASPHALT SHINGLE RIDGE CAP – SEE DETAIL 7/A-502

LINTEL NOTES

A. ALL LINTELS SHALL BEAR A MINIMUM 8" ON CMU.

B. AT EXTERIOR CONDITIONS, ONLY THE STEEL PLATE SHALL BE GALVANIZED, PROVIDED THE STEEL BEAM IS NOT EXPOSED.

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BILL PICKERING REGISTERED No. 4915 COMMONWEALTH OF KENTUCKY ARCHITECT 21 DECEMBER 2023

ROOF PLAN - PAVILION WITH RESTROOMS / RESTROOM ROOF FRAMING PLAN

FREEMAN LAKE PARK - SHELTERS PROJECT

FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY

CONSTRUCTION DOCUMENTS

Issue Date:	December 22, 2023
Drawn By:	JMT
Checked By:	BP

Revisions:

Mark	Date
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Project Number
21049.05

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A-103

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XRefs:
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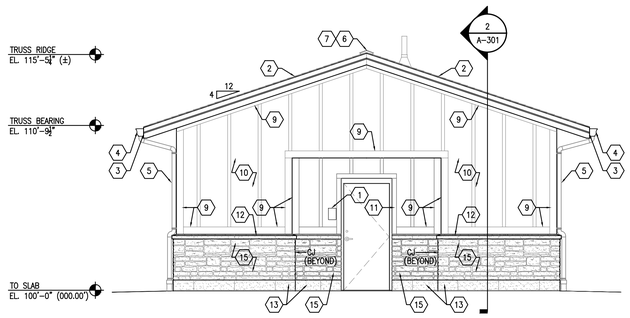
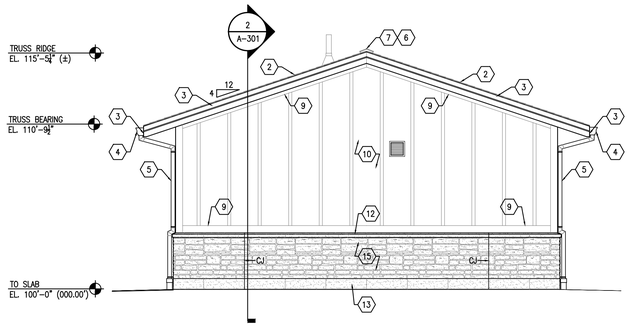
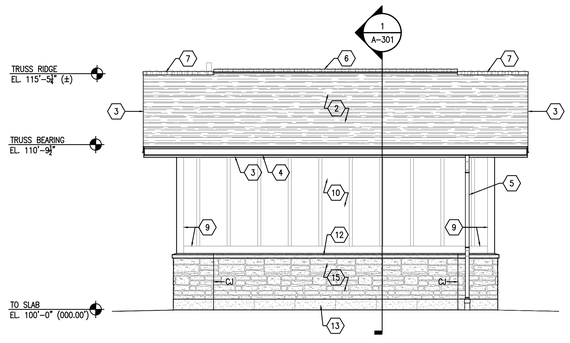
RESTROOM BLDG.



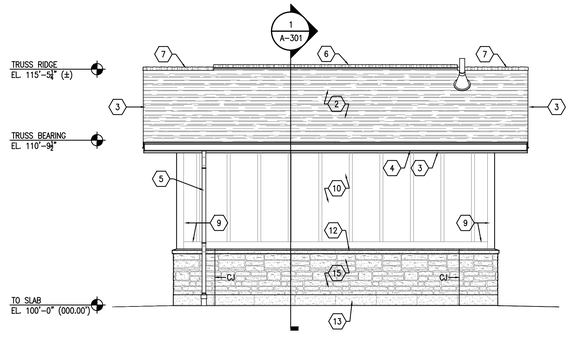
1 A-201 RESTROOM EXT ELEVATION
1/4" = 1'-0"



2 A-201 RESTROOM EXT ELEVATION
1/4" = 1'-0"

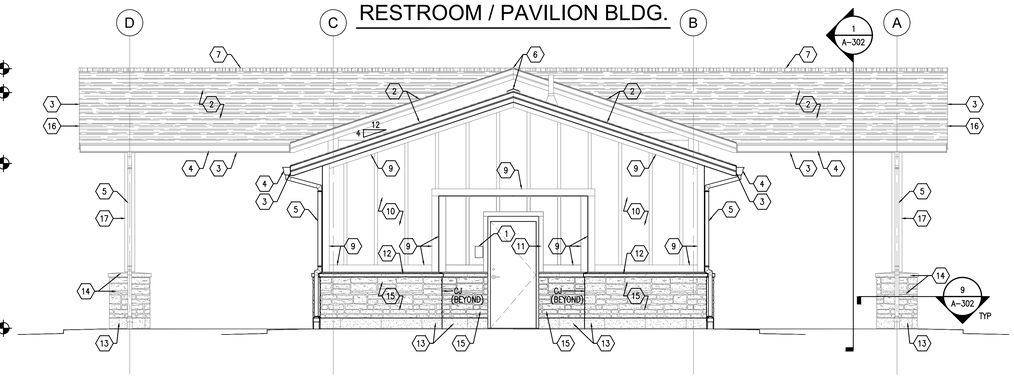


3 A-201 RESTROOM EXT ELEVATION
1/4" = 1'-0"

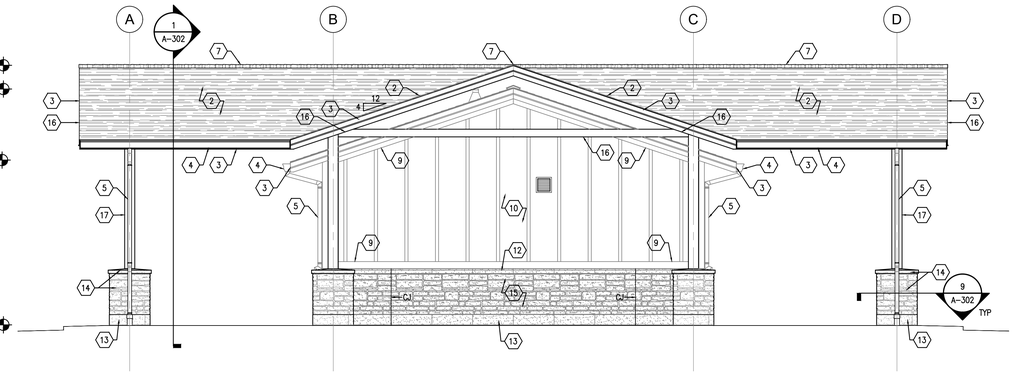


4 A-201 RESTROOM EXT ELEVATION
1/4" = 1'-0"

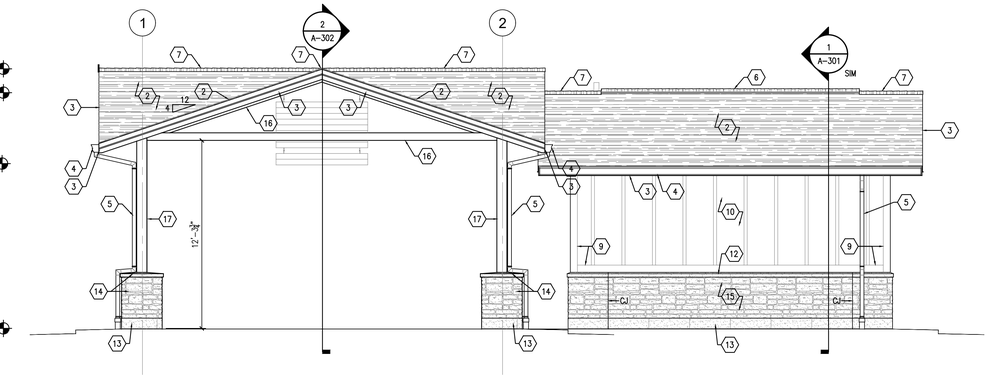
RESTROOM / PAVILION BLDG.



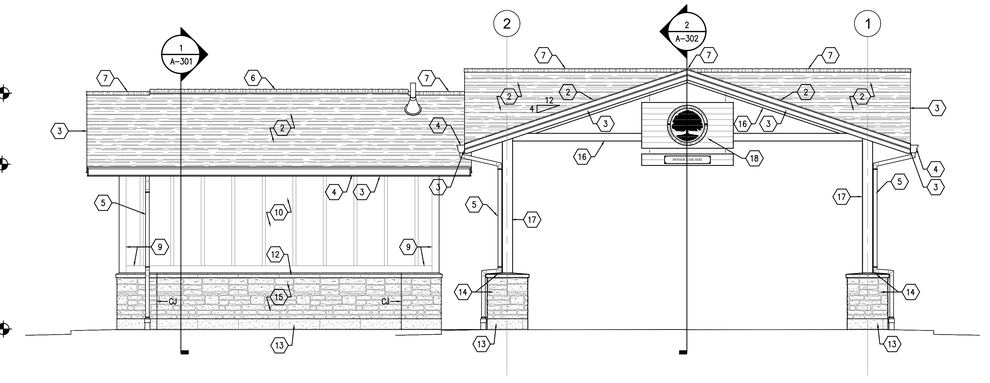
5 A-201 RESTROOM / PAVILION EXT ELEVATION
1/4" = 1'-0"



6 A-201 RESTROOM / PAVILION EXT ELEVATION
1/4" = 1'-0"



7 A-201 RESTROOM / PAVILION EXT ELEVATION
1/4" = 1'-0"



8 A-201 RESTROOM / PAVILION EXT ELEVATION
1/4" = 1'-0"

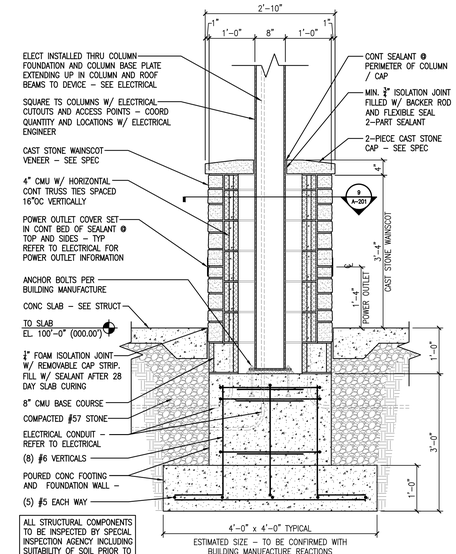
GENERAL NOTES

A. REFER TO DRAWING SHEET A-101 'GENERAL NOTES'

SHEET KEYNOTES ⬡

1. 6"(W)X9"(H) ADA COMPLIANT ROOM SIGNAGE – SEE SPECIFICATIONS
2. ARCHITECTURAL ASPHALT SHINGLE OVER (1) LAYER OF #30 FELT AND SELF-ADHERING ICE/WATER UNDERLAYMENT – REFER TO ROOF PLAN A-103 FOR UNDERLAYMENT LIMITS
3. CONTINUOUS PREFINISHED METAL FASCIA OVER 2X EXTERIOR GRADE VERTICAL FASCIA BOARD AND ¾" EXTERIOR GRADE FINISH PLYWOOD – PROVIDE CONCEALED ANCHORS – COLOR TO BE SELECTED BY OWNER
4. CONTINUOUS PREFINISHED METAL GUTTER WITH SUPPORT BRACKETS SPACED @ 32" OC MIN.
5. 3"X4" PREFINISHED METAL DOWNSPOUT W/ COLOR MATCHED ANCHOR STRAPS SPACED PER MANF RECOMMENDATIONS. CONNECT DOWNSPOUT TO SUBSURFACE DRAINAGE PIPING – REFER TO CIVIL DWG'S AND SPEC'S
6. ARCHITECTURAL ASPHALT SHINGLE RIDGE VENT – SEE DETAIL 8/A-301
7. ARCHITECTURAL ASPHALT SHINGLE RIDGE CAP – SEE DETAIL 7/A-301
8. PROVIDE PIPE BOOT AND SELF-ADHERING ICE AND WATER SHEET AT PERIMETER OF PIPE PENETRATION – SEE DETAIL 9/A-301 FOR SPECIFIC ROOF SYSTEM TYPE @ PENETRATION. INSTALL BOOT PER MANF'S RECOMMENDATIONS.
9. 5¼"(W) FIBER CEMENT TRIM BOARD – TYPE (TB2)
10. 8"(T) PREFINISHED FIBER CEMENT VERT SIDING PANEL (TYPE VPS1) W/ 2½"(W) VERT FIBER CEMENT BATTEN BOARDS SPACED 16"OC – TYPE (BB1)
11. 3½"(H) FIBER CEMENT TRIM BOARD AT PERIMETER OF DOOR (TYPE TB1) – SEE DETAILS 4 & 7/A-302
12. CAST STONE WAINSCOT W/ PRECAST SLOPED ACCENT BAND – SEE WALL SECTIONS 3/A-301 AND 4/A-301
13. CAST STONE BASE ACCENT BAND – SEE WALL SECTIONS 3/A-301 AND 4/A-301
14. CAST STONE COLUMN WRAP W/ 2-PIECE PRECAST CONC CAP W/ SLOPED TOP – SEE DETAILS 9/A-201 AND 10/A-201
15. CAST STONE WAINSCOT – SEE WALL SECTIONS 3/A-301 AND 4/A-301
16. PRE-ENGINEERED TUBE STEEL 'GABLE ROOF RECTANGLE' STRUCTURE – SEE SPEC SECTION 130000
17. PRE-ENGINEERED SQUARE TUBE STEEL COLUMNS W/ ELECTRICAL CUTOUTS AND ACCESS POINTS – COORD QUANTITY AND LOCATIONS W/ ELECTRICAL ENGINEER
18. GABLE SIGNAGE (CUSTOM) – SEE DETAIL 3/A-302. ARTWORK TEMPLATE WILL BE PROVIDED BY OWNER DURING SHOP DRAWING PHASE
19. MECHANICAL LOUVER – COLOR TO BE SELECTED BY OWNER – SEE MECHANICAL DWG'S AND SPEC'S

9 A-201 COLUMN BASE DETAIL
3/4" = 1'-0"



ALL STRUCTURAL COMPONENTS TO BE INSPECTED BY SPECIAL INSPECTION AGENCY INCLUDING SUITABILITY OF SOIL PRIOR TO CONCRETE PLACEMENT

10 A-202 COLUMN BASE DETAIL
3/4" = 1'-0"

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BILL PICKERING REGISTERED No. 7935 Commonwealth of KENTUCKY ARCHITECT
21 DECEMBER 2023

EXTERIOR ELEVATIONS - RESTROOMS AND PAVILION WITH RESTROOMS

FREEMAN LAKE PARK - SHELTERS PROJECT

FREEMAN LAKE PARK ROAD
ELIZABETHTOWN, KENTUCKY

CONSTRUCTION DOCUMENTS

Issue Date:	December 22, 2023
Drawn By:	JMT
Checked By:	BP

Revisions:

Mark	Date
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Project Number
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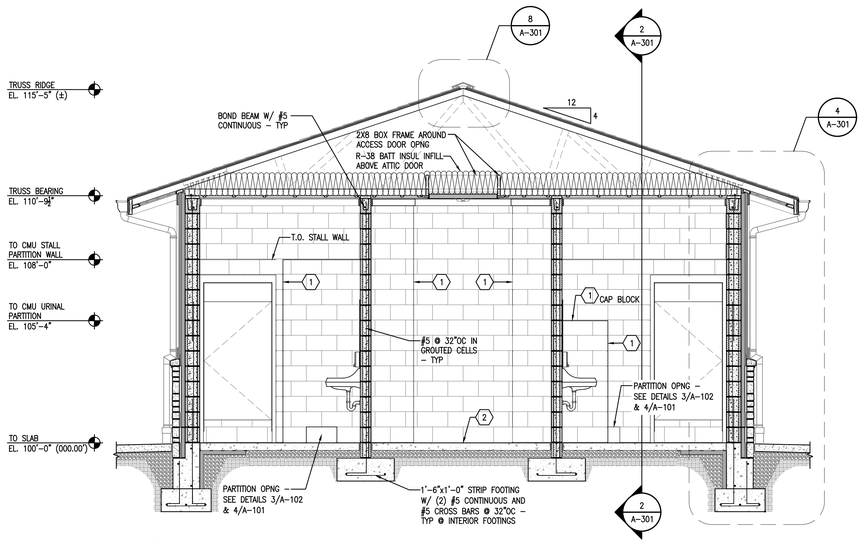
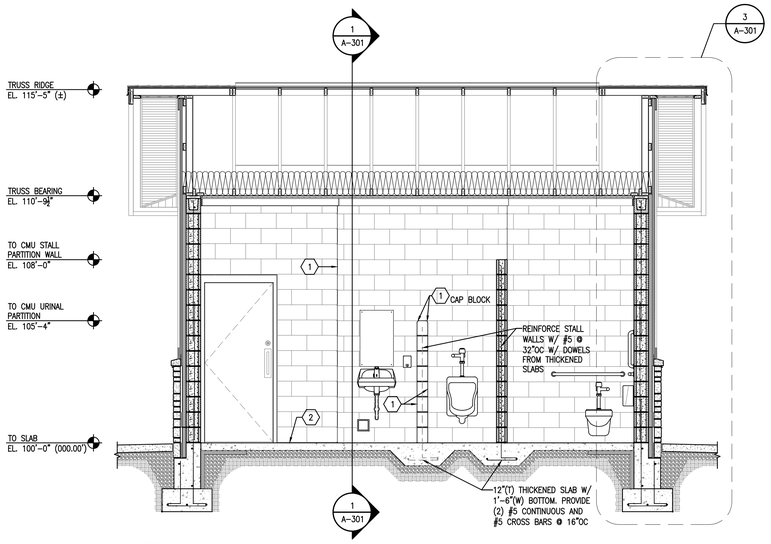
A-201



1 A-301 BUILDING SECTION
3/8" = 1'-0"



2 A-301 BUILDING SECTION
3/8" = 1'-0"

GENERAL NOTES

A. REFER TO DRAWING SHEET A-101 'GENERAL NOTES'

SHEET KEYNOTES ⬡

1. ALL EXPOSED OUTSIDE CORNERS OF CMU FINISHED W/ BULLNOSE CMU
2. 4"(T) CONCRETE SLAB ON-GRADE REINFORCED WITH WWF 6x6-W2.9xW2.9 OVER 10 MIL VAPOR BARRIER OVER MINIMUM 4" CRUSHED STONE ON PROPERLY PREPARED SOIL SUBGRADE - TYP

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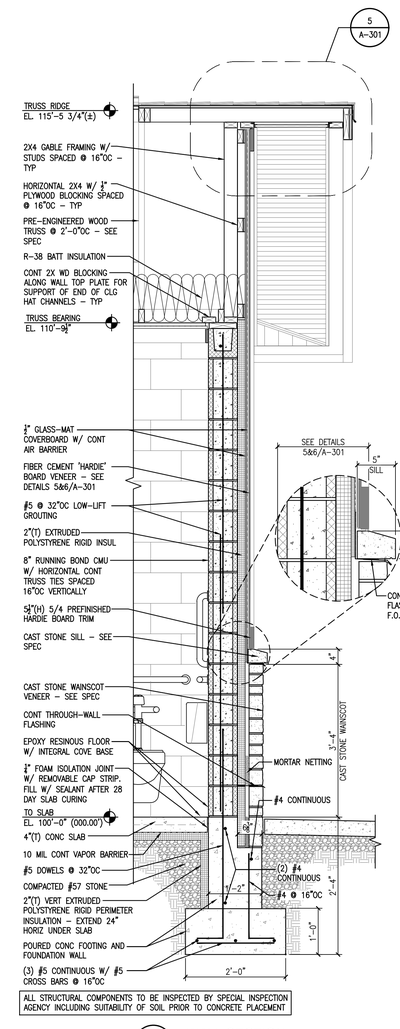
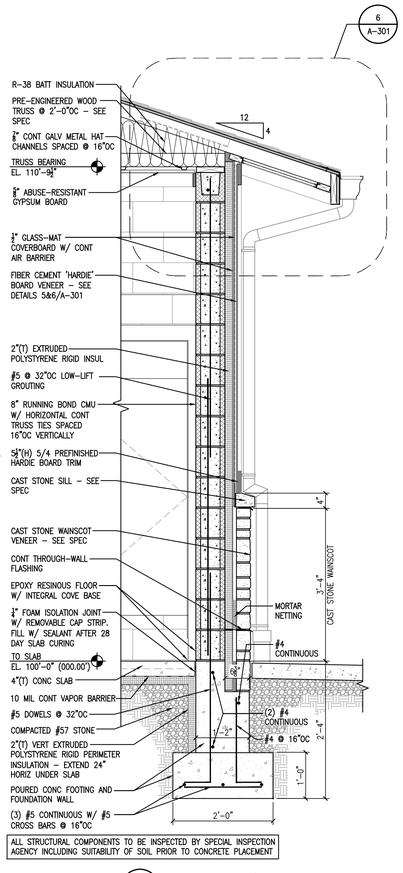


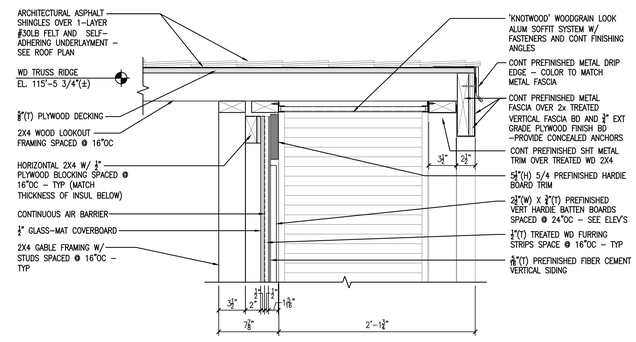
ALL STRUCTURAL COMPONENTS TO BE INSPECTED BY SPECIAL INSPECTION AGENCY INCLUDING SUITABILITY OF SOIL PRIOR TO CONCRETE PLACEMENT

3 A-301 WALL SECTION
3/4" = 1'-0"

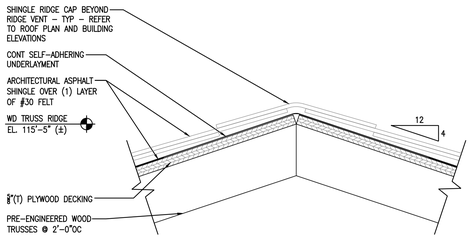


ALL STRUCTURAL COMPONENTS TO BE INSPECTED BY SPECIAL INSPECTION AGENCY INCLUDING SUITABILITY OF SOIL PRIOR TO CONCRETE PLACEMENT

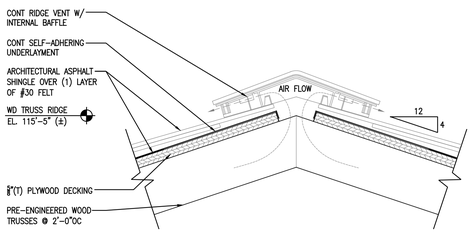
4 A-301 WALL SECTION
3/4" = 1'-0"



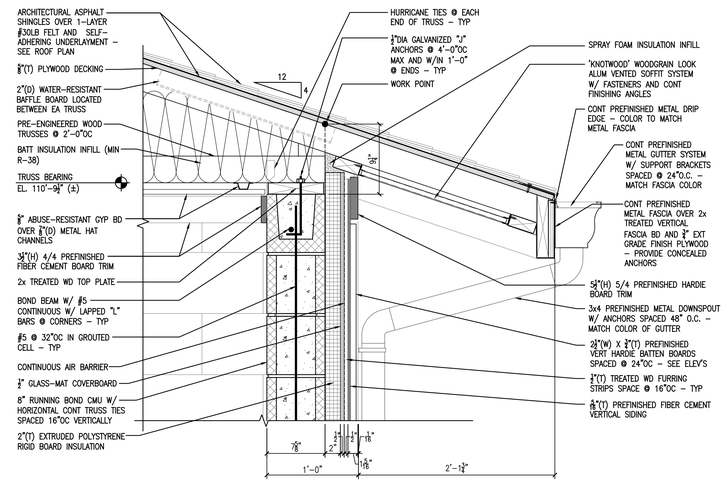
5 A-301 GABLE END DETAIL
1 1/2" = 1'-0"



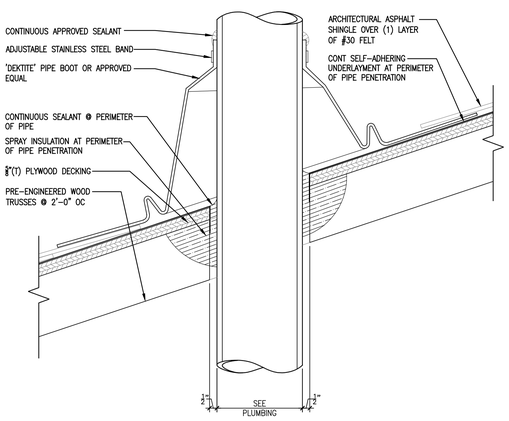
7 A-301 RIDGE DETAIL
3" = 1'-0"



8 A-301 RIDGE VENT DETAIL
3" = 1'-0"



6 A-301 EAVE / SOFFIT DETAIL
1 1/2" = 1'-0"



9 A-301 PIPE FLASHING DETAIL
3" = 1'-0"

BUILDING SECTIONS / WALL SECTIONS / DETAILS

FREEMAN LAKE PARK - SHELTERS PROJECT

FREEMAN LAKE PARK ROAD
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Project Number
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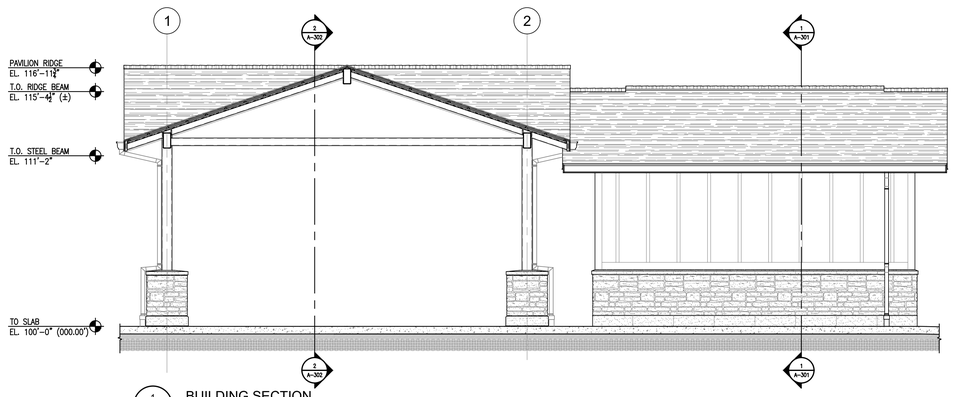
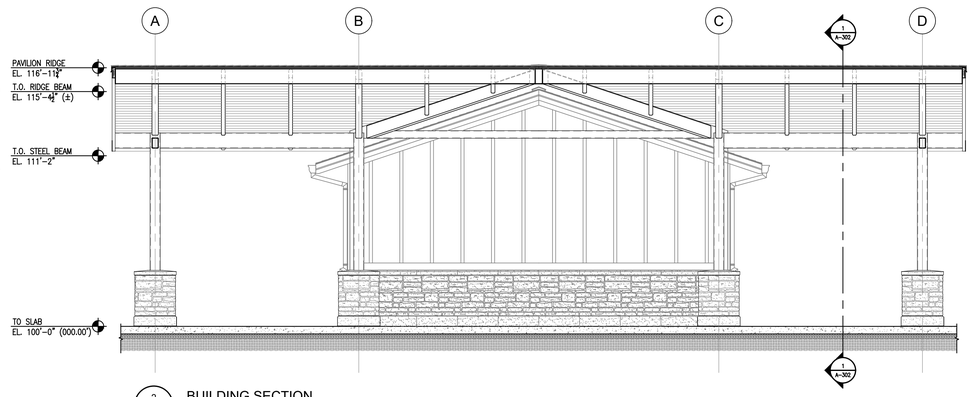


1 A-302 BUILDING SECTION
1/4" = 1'-0"



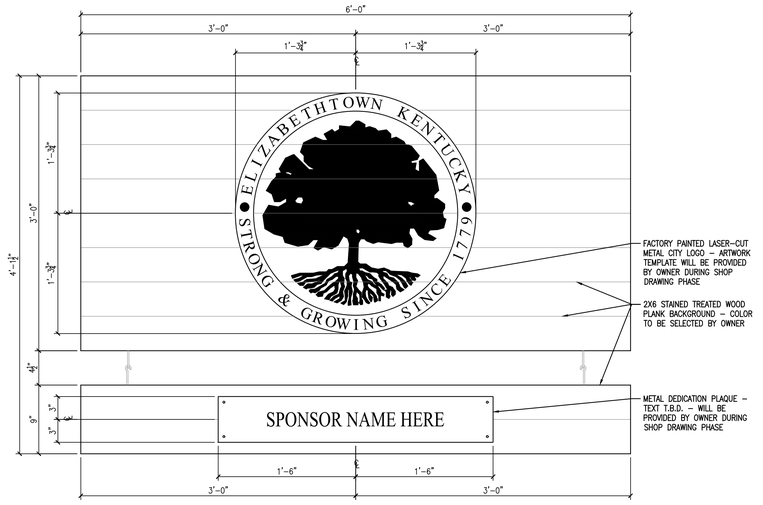
2 A-302 BUILDING SECTION
1/4" = 1'-0"

GENERAL NOTES

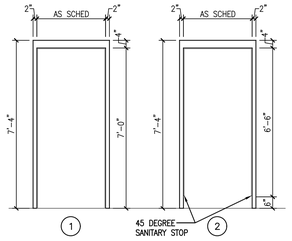
A. REFER TO DRAWING SHEET A-101 'GENERAL NOTES'

SHEET KEYNOTES ⬡

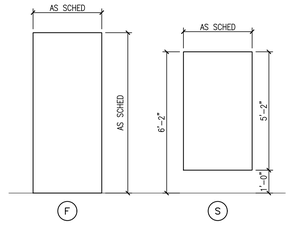
1. 4"(SQ) PREFINISHED METAL DOWNSPOUT W/ COLOR MATCHED ANCHOR STRAPS SPACED PER MANF RECOMMENDATIONS. CONNECT DOWNSPOUT TO SUBSURFACE DRAINAGE PIPING – REFER TO CIVIL DWG'S AND SPEC'S



3 A-302 GABLE SIGNAGE
1 1/2" = 1'-0"



12 A-302 DOOR FRAME ELEVATIONS
3/8" = 1'-0"



13 A-302 DOOR ELEVATIONS
3/8" = 1'-0"

ROOM FINISH SCHEDULE

	ROOM NO.	ROOM NAME	FLOOR MATERIAL	FLOOR FINISH	BASE FINISH	NORTH WALL MATERIAL	NORTH WALL FINISH	SOUTH WALL MATERIAL	SOUTH WALL FINISH	EAST WALL MATERIAL	EAST WALL FINISH	WEST WALL MATERIAL	WEST WALL FINISH	CEILING MATERIAL	CEILING FINISH	CEILING HEIGHT	REMARKS REFER TO KEYED NOTES	ROOM NO.
RESTROOM	101	MEN'S RESTROOM	CONC	FPT-1	-	CMU	WPT-2	CMU	WPT-2	CMU	WPT-2	CMU	WPT-2	GYP BD	CPT-1	10'-8"	-	101
	101A	H.C. STALL	CONC	FPT-1	-	CMU	WPT-2	CMU	WPT-2	CMU	WPT-2	CMU	WPT-2	GYP BD	CPT-1	10'-8"	-	101A
	102	UTILITY	CONC	FPT-1	-	CMU	WPT-1	CMU	WPT-1	CMU	WPT-1	CMU	WPT-1	GYP BD	CPT-1	10'-8"	-	102
	102A	ALCOVE	CONC	SEE CIVIL	-	-	-	-	-	-	-	-	-	ALUM	PRE	9'-4"	-	102A
	103	WOMENS RESTROOM	CONC	FPT-1	-	CMU	WPT-2	CMU	WPT-2	CMU	WPT-2	CMU	WPT-2	GYP BD	CPT-1	10'-8"	-	103
	103A	H.C. STALL	CONC	FPT-1	-	CMU	WPT-2	CMU	WPT-2	CMU	WPT-2	CMU	WPT-2	GYP BD	CPT-1	10'-8"	-	103A
	103B	STALL	CONC	FPT-1	-	CMU	WPT-2	CMU	WPT-2	CMU	WPT-2	CMU	WPT-2	GYP BD	CPT-1	10'-8"	-	103B
PAVILION	104	PAVILION	CONC	SEE CIVIL	-	-	-	-	-	-	-	-	-	ALUM	PRE	SLOPED	-	104

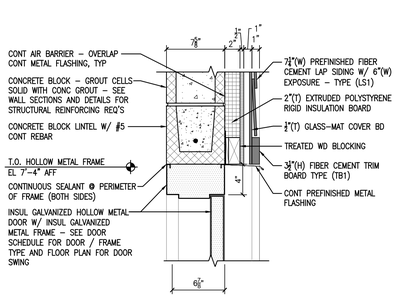
GENERAL:
A. REFER TO SPECIFICATION SECTION 099113 FOR INTERIOR PAINT DESIGNATIONS

DOOR SCHEDULE

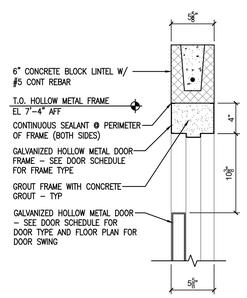
	DOOR NO.	OPENING FROM (ROOM NAME)	OPENING TO (ROOM NAME)	OPENING WIDTH	OPENING HEIGHT	OPENING NO DOOR LEAVES	FRAME MATERIAL	FRAME GA	FRAME THERMAL RATED (T)	FRAME RNISH	FRAME ELEV	FRAME JAMB DEPTH	DOOR MATERIAL	DOOR GA	DOOR CORE	DOOR THK	DOOR FINISH	DOOR ELEV	HARDWARE SET NO	HARDWARE DEG CLSR	HARDWARE KEYSIDE RM NO	DETAILS HEAD	DETAILS JAMB	DETAILS THR	FIRE MIN	REMARKS	DOOR NO.
RESTROOM	101	ALCOVE 102A	MEN'S RESTROOM 101	3'-0"	7'-0"	1	GALV HM	16	T	MPT-1	1	7 5/8"	GALV HM	16	INSUL	1 3/4"	MPT-1	F	1	105	ALCOVE 102A	4/A-302	7/A-302	T1	-	-	101
	101A	MEN'S RESTROOM 101	H.C. STALL	3'-0"	5'-2"	1	GALV HM	16	-	MPT-1	1	5 5/8"	GALV HM	16	-	1 3/4"	MPT-1	S	2	-	MEN'S RESTROOM 101	5/A-302	8/A-302	T2	-	-	101A
	102	ALCOVE 102A	UTILITY 102	3'-0"	7'-0"	1	GALV HM	16	T	MPT-1	1	7 5/8"	GALV HM	16	INSUL	1 3/4"	MPT-1	F	3	105	ALCOVE 102A	4/A-302	7/A-302	T1	-	-	102
	102A	UTILITY 102	ATTIC	1'-10"	3'-0"	1	HM	-	-	MPT-2	-	-	HM	-	-	-	MPT-2	-	-	-	UTILITY 102	-	6/A-302	-	-	1	102A
	103	ALCOVE 102A	WOMENS RESTROOM	3'-0"	7'-0"	1	GALV HM	16	T	MPT-1	1	7 5/8"	GALV HM	16	INSUL	1 3/4"	MPT-1	F	1	105	ALCOVE 102A	4/A-302	7/A-302	T1	-	-	103
	103A	WOMENS RESTROOM 103	H.C. STALL	3'-0"	5'-2"	1	GALV HM	16	-	MPT-1	1	5 5/8"	GALV HM	16	-	1 3/4"	MPT-1	S	2	-	WOMENS RESTROOM 103	5/A-302	8/A-302	T2	-	-	103A
	103B	WOMENS RESTROOM 103	STANDARD STALL	2'-2"	5'-2"	1	GALV HM	16	-	MPT-1	1	5 5/8"	GALV HM	16	-	1 3/4"	MPT-1	S	2	-	WOMENS RESTROOM 103	5/A-302	8/A-302	T2	-	-	103B

GENERAL:
A. REFER TO SPECIFICATION SECTION 099113 AND 099123 FOR EXTERIOR AND INTERIOR PAINT DESIGNATIONS

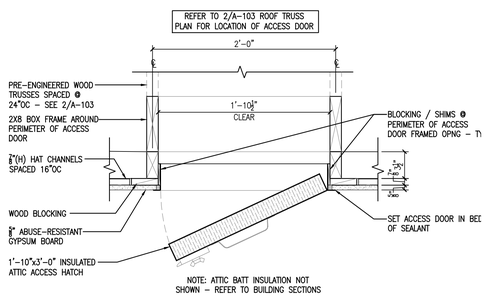
REMARKS:
1. ACCESS DOOR WITH CAM LATCH AND KEYED LOCK – FRAME PERIMETER CAULKED



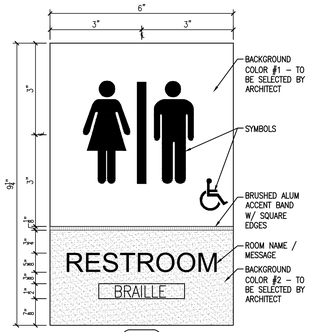
4 A-302 HEAD DETAIL
1 1/2" = 1'-0"



5 A-302 DOOR HEAD DETAIL
1 1/2" = 1'-0"



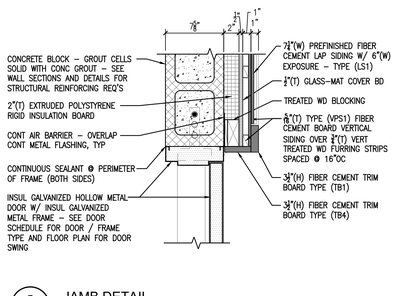
6 A-302 ATTIC ACCESS DOOR DETAIL
1 1/2" = 1'-0"



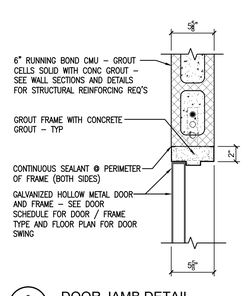
ROOM SIGNAGE SCHEDULE

DOOR NO.	ROOM NO.	SIGN LOCATION ROOM NO.	MESSAGE	SIGN TYPE	SYMBOL
101	101	ALCOVE 102A	MENS RESTROOM	P1	GENDER - MALE ACCESSIBILITY SYMBOL
-	101	MENS RESTROOM 101	NO SMOKING	P3	NO SMOKING
102	102	ALCOVE 102A	UTILITY	P2	CITY LOGO
-	104	UTILITY 102	NO SMOKING	P3	NO SMOKING
103	103	ALCOVE 102	WOMENS RESTROOM	P1	GENDER - FEMALE ACCESSIBILITY SYMBOL
-	103	WOMENS RESTROOM 103	NO SMOKING	P3	NO SMOKING

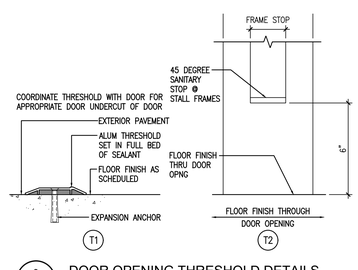
GENERAL:
A. COORDINATE LOCATION OF 'NO SMOKING' SIGNAGE WITH ARCHITECT.
B. OWNER SHALL PROVIDE 'CITY LOGO' TEMPLATE DURING SHOP DRAWING REVIEW PERIOD.
C. SEE SPECIFICATION SECTION 101425 – ROOM IDENTIFICATION SIGNAGE.



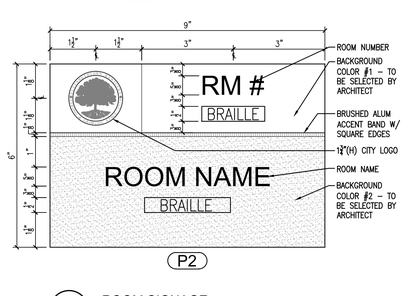
7 A-302 JAMB DETAIL
1 1/2" = 1'-0"



8 A-302 DOOR JAMB DETAIL
1 1/2" = 1'-0"



9 A-302 DOOR OPENING THRESHOLD DETAILS
3" = 1'-0"



11 A-302 ROOM SIGNAGE
6" = 1'-0"

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COMMONWEALTH OF KENTUCKY
LICENSED ARCHITECT
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BUILDING SECTIONS / SCHEDULES / DETAILS

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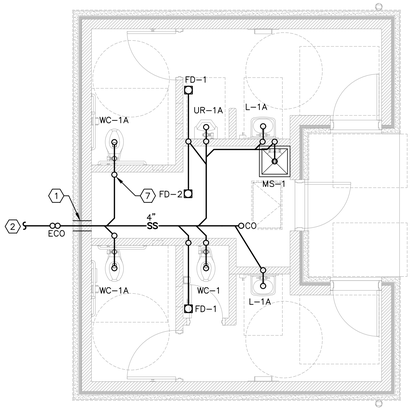
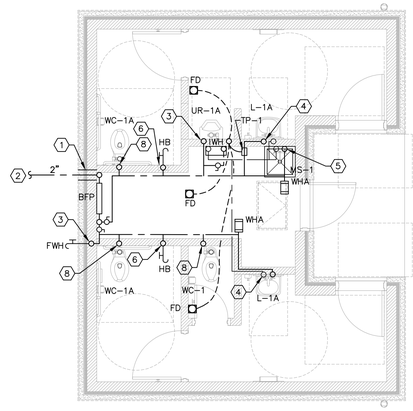


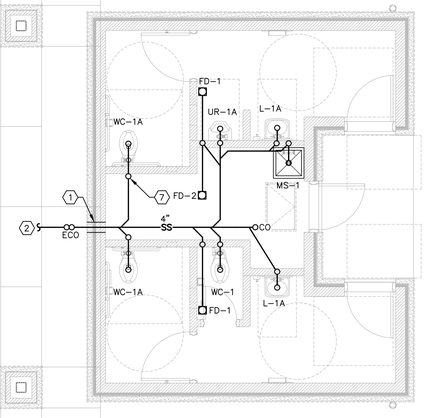
PLUMBING WASTE & VENT PLAN – RESTROOM

1/4" = 1'-0"



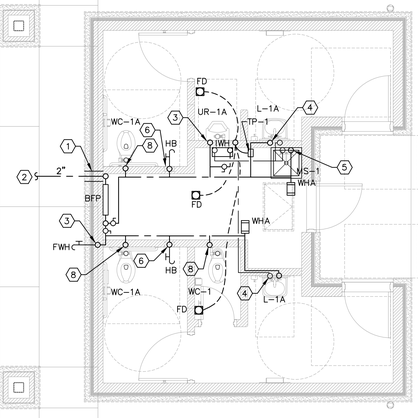
DOMESTIC WATER PLAN – RESTROOM

1/4" = 1'-0"



PLUMBING WASTE & VENT PLAN – PAVILION

1/4" = 1'-0"



DOMESTIC WATER PLAN – PAVILION

1/4" = 1'-0"

GENERAL SHEET NOTES

A. CONTRACTOR TO BE RESPONSIBLE FOR ALL FINAL DIMENSIONS.

B. CONTRACTOR SHALL NOT CUT ANY BUILDING STRUCTURAL MEMBER WITHOUT WRITTEN APPROVAL FROM THE STRUCTURAL ENGINEER/ARCHITECT.

C. CONTRACTOR TO COORDINATE WORK SCHEDULE WITH OTHER TRADES AND OWNER.

D. CONTRACTOR TO COORDINATE ALL NEW WORK SO AS NOT TO DAMAGE ANY EXISTING OR NEW EQUIPMENT.

E. CONTRACTOR SHALL VERIFY ELECTRICAL CHARACTERISTICS OF ALL EQUIPMENT PRIOR TO INSTALLING SAME.

F. ALL WORK AREAS TO BE CLEANED AT THE END OF EACH WORK DAY.

G. CONTRACTOR TO COORDINATE ALL PIPING, ELECTRICAL CONDUIT, DUCTWORK, ROOF OPENINGS, AND EQUIPMENT PLACEMENT AND OTHER WORK WITHIN ALL TRADES.

H. PROVIDE FIRE STOPPING AT ALL PENETRATIONS THROUGH RATED WALL AND CEILING ASSEMBLIES. CONTRACTOR IS RESPONSIBLE FOR SEALING ALL OPENINGS LEFT BY THE INSTALLATION OF PIPING. REFER TO CUTTING AND PATCHING SPECIFICATION.

I. PROVIDE ALL SUBMITTALS AS REQUIRED FOR PERMITTING AND FINAL APPROVAL BY LOCAL BUILDING AND HEALTH DEPARTMENT.

J. ALL EQUIPMENT AND MATERIALS SHALL BE INSTALLED AS PER MANUFACTURER'S SPECIFICATIONS TO PROVIDE A COMPLETE SYSTEM.

K. ALL PLUMBING EQUIPMENT AND INSTALLATION SHALL CONFORM WITH THE KENTUCKY PLUMBING CODE AND SHALL BE INSTALLED BY CERTIFIED LICENSED MASTER PLUMBER.

L. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PAYING FOR AND OBTAINING ALL PERMITS.

M. ALL GREASE TRAP KITCHEN SANITARY WASTE PIPING SHALL BE CAST IRON OUT TO GREASE TRAP. ALL UNDERSLAB SANITARY SEWER PIPING SHALL BE SCH 40 PVC ASTM DM84-TB WITH SOLVENT WELDED JOINTS ASTM D2665-69. OWNER SHALL COORDINATE LOCATION AND INSTALLATION AND ROUTING WITH APPROVAL BY PLUMBING INSPECTOR. THIS SYSTEM TO TIE TO THE SANITARY SEWER MAIN.

N. ALL ABOVE SLAB SANITARY SOIL WASTE AND VENT PIPING SHALL BE THE SAME AS THAT SPECIFIED ABOVE.

O. ALL ABOVE SLAB DOMESTIC HOT AND COLD WATER PIPING SHALL BE COPPER TYPE K.

P. WHERE PIPING IS INSTALLED IN OUTSIDE WALLS CONTRACTOR SHALL ENSURE THAT PIPING IS INSTALLED INSIDE BUILDING WALL INSULATION. NO WATER SUPPLY PIPING SHALL BE INSTALLED WHERE IT CAN FREEZE.

CODED SHEET NOTES:

1. SLEEVE THROUGH FOUNDATION.
2. SEE SITE PLAN FOR CONTINUATION.
3. 3/4" CWS DOWN IN WALL TO FIXTURE.
4. 1/2" CWS & 1/2" HWS DOWN IN WALL TO FIXTURE.
5. 3/4" CWS & 3/4" HWS DOWN IN WALL TO FIXTURE.
6. 1/2" CWS DOWN IN WALL TO FIXTURE.
7. VTR, FLASHING AT ROOF, PAINTED TO MATCH COLOR BY ARCHITECT. MAINTAIN 15' SEPARATION FROM OUTSIDE AIR INTAKES OF HVAC SYSTEM.
8. 1" CWS DOWN IN WALL TO FIXTURE.

SHEET LEGEND

	BALL VALVE
	THERMOSTAT
	PUMP
	PRESSURE AND TEMPERATURE VALVE
	UNION
FWH	WALL HYDRANT (FREEZELESS)
HB-1	HOSE BIBB
FD-1	FLOOR DRAIN
WH-1	HOT WATER HEATER
CO	CLEAN OUT (FLOOR)
ECO	EXTERIOR CLEAN OUT
L-1	LAVATORY
L-1A	LAVATORY (ADA HEIGHT)
UR-1	URINAL
WC-1	WATER CLOSET
WC-1A	WATER CLOSET (ADA HEIGHT)
LS-1	LAB SINK
BS-1	BAR SINK
KS-1	KITCHEN SINK
MS-1	MOP SINK
EWC-1A	ELECTRIC WATER COOLER SPLIT LEVEL (ADA HEIGHT)
ET-1	EXPANSION TANK
	GATE VALVE
	WASTE LINE
	VENT LINE
	HOT WATER
	COLD WATER
	HOT WATER RECIRC. LINE
G	GAS LINE
CD	COPPER CONDENSATE DRAIN
ST	STORM WATER LINE

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COMMONWEALTH OF KENTUCKY
WILLIAM G. WILSON
17178
LICENSED PROFESSIONAL ENGINEER

Plumbing Plans

CITY OF ELIZABETHTOWN
FREEMAN LAKE PARK
ELIZABETHTOWN, KENTUCKY

CONSTRUCTION DOCUMENTS

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Checked By:	WGWILSON
Revisions:	

Mark	Date

AHU SEAL

Project Number
21049.05

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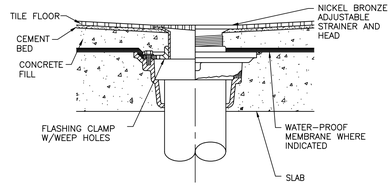
PLUMBING FIXTURE & PLUMBING SPECIALTIES SCHEDULE

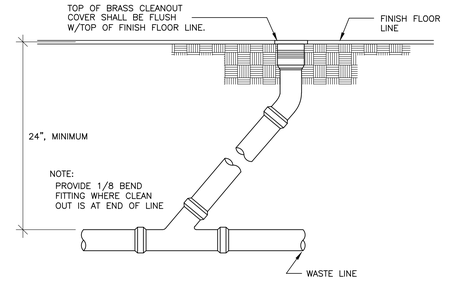
MARK	MFR & MODEL	TYPE	TRIM	SUPPLY	DRAIN	COLOR	MOUNTING	MISC.
BFP	WATTS 909-OSY-QT-S	REDUCED PRESSURE		LINE SIZED				PROVIDE AIR GAP FITTING RELIEF TO FLOOR DRAIN
CO	ZURN ZN-1400-VP	INTERIOR CLEANOUT			LINE SIZE	NICKLE-BRONZE	FLOOR	ADJUSTABLE FLOOR CLEANOUT WITH V.P. SCREWS
ECO	ZURN Z-1402-VP	HEAVY DUTY CLEANOUT EXTERIOR			LINE SIZE	CAST IRON	GROUND	W/ 18"x18"x6" CONCRETE SUPPORTING PAD AND VANDAL-PROOF SCREWS
ET-1	STATE ETC-10X	EXPANSION TANK		3/4" MPT			PIPE	9.2 GALLON CAPACITY W/ STOP VALVE
FD-1	ZURN MODEL ZN-415-7B-DP-VP	4" DRAIN	ZURN Z-1022 TRAP PRIMER SUPPLY	1/2" IPS C.W.	4"	NICKLE-BRONZE	FLOOR	4" DIA. MEDIUM DUTY TOP AND VANDAL PROOF DECORATIVE TOP
FD-2	ZURN MODEL ZN-507-VP-AR	4" DRAIN	ZURN Z-1022 TRAP PRIMER SUPPLY	1/2" IPS C.W.	4"	NICKLE-BRONZE	FLOOR	7" DIA. MEDIUM DUTY TOP, VANDAL-PROOF, ACID RESISTANT
IWH	EEMAX EX95T-ML	INSTANTANEOUS WATER HEATER	10.75"Hx5.25"Wx3"	9500 WATTS, 240V, 1P			WALL MOUNTED	P&T VALVE TO DRAIN AHEAD OF P-TRAP UNDER SINK
FWH	WOODFORD B65	FREEZELESS WALL HYDRANT		3/4" IPS C.W.		POLISHED BRASS	WALL, RECESSED	INTEGRAL ANTI-SIPHON BACKFLOW PREVENTER
HB	HOSE BIBB WOODFORD B24	HOSE BIBB IN WALL BOX		1/2" IPS C.W.		POLISHED BRASS	WALL, RECESSED	CHROME FINISH MOUNT 18" AFF
L-1A	AM. STANDARD 0355.012	V.C. LAVATORY (ADA)	AMERICAN STANDARD #6053.205 SENSOR 0.5 GPM, BATTERY	3/8" SPS W/ LOOSE KEY STOPS	1 1/4" P-TRAP	WHITE	WALL W/ CONCEALED ARM	INSULATE TRAP & SUPPLIES W/ TRUEBRO TRAP WRAP PROTECTIVE KIT. SLOAN BACK CHECKS ON FLOW CONTROL.
MS-1	MOP SINK FIAT MSB-2424	SERVICE SINK 24"x24"	FIAT 830-AA FAUCET AND 832-AA HOSE BRACKET	3/4" IPS CW & HW	3" P-TRAP	MOLDED STONE	FLOOR	SS DOME & LINT STRAINER 899CC MOP HANGER, SS WALL SKIRTS
UR-1A	KOHLER K5016-ET	V.C. URINAL (ADA)	SLOAN 8186MC SENSOR	3/4" IPS CW	2"	WHITE	WALL W/ CARRIER	MOUNT 17" AFF TO LIP
WC-1	AM. STANDARD 2257.103	V.C. WATER CLOSET	SLOAN 8111MC SENSOR W/ MANUAL PUSH BUTTONS	1" IPS C.W.	4"	WHITE	WALL W/ CARRIER	SEAT BENEKE, WHITE MOUNT RIM 16" AFF
WC-1A	AM. STANDARD 2257.103	V.C. WATER CLOSET (ADA)	SLOAN 8111MC SENSOR W/ MANUAL PUSH BUTTONS	1" IPS C.W.	4"	WHITE	WALL W/ CARRIER	SEAT BENEKE, WHITE MOUNT RIM ADA HEIGHT
WHA	ZURN MODEL Z1700-100	WATER HAMMER ARRESTOR		3/4"		STAINLESS STEEL	PIPE	WITH STOP VALVE

NOTE: ALL EXPOSED PLUMBING SHALL BE METAL, NO PVC.

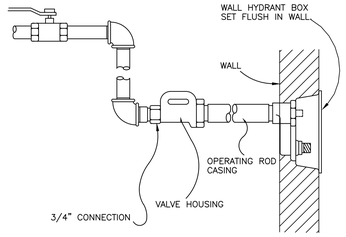
NOTE: SINKS SHALL HAVE CHROME PLATED P-TRAPS AND TAILPIECES. PROVIDE 1/4 TURN STOPS FOR ALL SUPPLIES TO KITCHEN SINKS AND LAVATORIES.



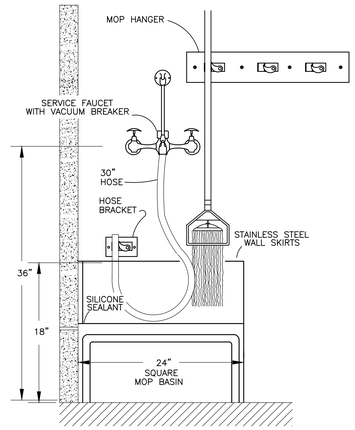
1 FLOOR DRAIN DETAIL
N.T.S.



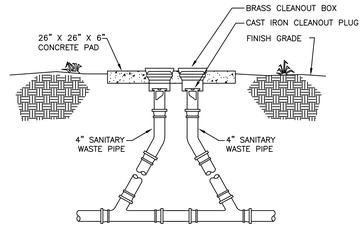
2 FLOOR CLEANOUT DETAIL
N.T.S.



3 FREEZEPROOF WH DETAIL
N.T.S.



4 MOP SINK DETAIL
N.T.S.



5 TWO-WAY EXTERIOR CLEANOUT DETAIL
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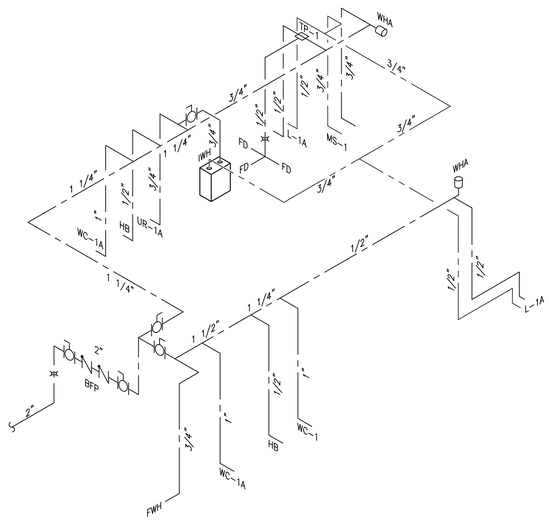
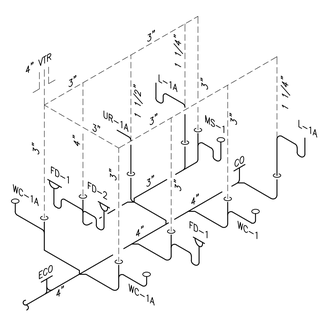


DOMESTIC WATER RISER
SCALE: N.T.S.



SOIL WASTE & VENT RISER
SCALE: N.T.S.

MECHANICAL AND PLUMBING PIPE & INSULATION SCHEDULE

PIPE & INSULATION	INTERIOR BELOW GRADE	INTERIOR ABOVE FLOOR	EXTERIOR WITHIN 5' OF BUILDING	EXTERIOR, BURIED
DOMESTIC COLD WATER, HOT WATER, & HOT WATER RECIRCULATION PIPING 3/4" ARMAFLEX EXTERIOR WRAP ON PIPING	SOFT COPPER: ASTM B 88 TYPE K HARD COPPER: ASTM B88 TYPE K	HARD COPPER: ASTM B88 TYPE L	SOFT COPPER: ASTM B 88 TYPE K HARD COPPER: ASTM B88 TYPE K	SOFT COPPER: ASTM B 88 TYPE K
SANITARY SEWER	PVC PLASTIC: ASTM D 2665 SCH 40	PVC PLASTIC: ASTM D 2665 SCH 40	PVC PLASTIC: ASTM D 2665 SCH 40	PVC PLASTIC: ASTM D 2665 SCH 40

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COMMONWEALTH OF KENTUCKY WILLIAM GREGORY WILSON 17178 LICENSED PROFESSIONAL ENGINEER

Plumbing Schedules & Details

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FREEMAN LAKE PARK
ELIZABETHTOWN, KENTUCKY

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Checked By:	WGWILSON
Revisions:	
Mark	Date

AHJ SEAL

Project Number
21049.05

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GENERAL LEGEND

- APPEARS ON SHEET WHERE SECTION IS CUT
- SECTION IDENTIFICATION LETTER
- SHEET WHERE SECTION IS DRAWN

- APPEARS ON THE SHEET WHERE SECTION IS DRAWN
- SECTION OR DETAIL IDENTIFICATION LETTER
- SHEET WHERE DRAWN

ENLARGED AREA OR PARTIAL PLAN SYMBOL
(ON SHEET WHERE INDICATED AND SHEET WHERE DRAWN)

- IDENTIFICATION LETTER
- SHEET WHERE DRAWN

PLAN MATCH LINE SYMBOL

CONNECTION OF NEW WORK TO EXISTING

LINE OR EQUIPMENT TO BE REMOVED

123	ROOM NUMBER
9'-6"	CEILING HEIGHT
AFF	ABOVE FINISHED FLOOR
TOS, BOS	TOP OF STEEL, BOTTOM
TOB, BOB	TOP OF BEAM, BOTTOM
TOJ, BOJ	TOP OF JOIST, BOTTOM
TOC, BOC	TOP OF CONCRETE, BOTTOM
TOP, BOP	TOP OF PIPE, BOTTOM
BOD	BOTTOM OF DECK

MECHANICAL LEGEND
HVAC, PLUMBING & FIRE PROTECTION

- 20x16 — NEW DUCT – 1ST FIGURE IS DIMENSION SHOWN
- SUPPLY OR OUTSIDE AIR DUCTWORK; PLAN, UP & DOWN
- RETURN OR EXHAUST DUCTWORK
- DROP AND RISE IN DIRECTION OF FLOW
- ACOUSTIC LINED DUCTWORK; PLAN
- SA — SUPPLY AIR DUCT
- OA — OUTSIDE AIR DUCT
- RA — RETURN AIR DUCT
- EA — EXHAUST AIR DUCT
- TA — TRANSFER AIR DUCT
- HVD — HIGH VELOCITY SUPPLY DUCT (MEDIUM PRESSURE)
- F/O — FLAT OVAL DUCT
- LOW PRESSURE FLEXIBLE DUCT
- ROUND DUCTWORK; PLAN, UP AND DOWN
- AIR FLOW; DIRECTION
- REHEAT COIL IN DUCT
- MANUAL VOLUME DAMPER; PLAN, ONE LINE DIAGRAM
- BDD — BACKDRAFT DAMPER

- MOTOR OPERATED DAMPER; PLAN, ONE LINE DIAGRAM
- FIRE DAMPER
- SMOKE DAMPER; PLAN, ONE LINE DIAGRAM (FIRE/SMOKE – FSD)
- AIR TURNING VANES; PLAN, ONE LINE DIAGRAM
- DUCT BRANCH TAKE OFF WITH RAKE OFF DAMPER; PLAN, ONE DIAGRAM
- DUCT TRANSITION; PLAN, ONE LINE DIAGRAM
- ACCESS DOOR, VERTICAL OR HORIZONTAL
- CEILING DIFFUSERS
- DUCT OR PIPE SECTION
- SUPPLY DIFFUSER; ONE, TWO, THREE AND FOUR WAY
- RETURN, EXHAUST OR TRANSFER GRILLE
- RETURN GRILLE WITH ACOUSTIC BAFFLE
- EXHAUST OR RETURN BOTTOM WALL REGISTER OR GRILLE
- EXHAUST OR RETURN TOP WALL REGISTER OR GRILLE
- DOOR GRILLE
- S–2 / 200 — AIR DEVICE DESIGNATION. (S) SUPPLY, (R) RETURN, (E) EXHAUST, (T) TRANSFER, (L) LOUVER; I.E. SUPPLY TYPE 2, 200 C.F.M.
- SLOT TYPE LINEAR SUPPLY DIFFUSER
- SLOT TYPE LINEAR RETURN GRILLE
- TERMINAL BOX WITH ATTENUATOR/REHEAT COIL
- A DIRECTION OF PIPE FLOW
- DIRECTION OF PIPE PITCH
- HWS — HOT WATER SUPPLY PIPING
- HWR — HOT WATER RETURN PIPING
- CWS — CONDENSER WATER SUPPLY PIPING
- CWR — CONDENSER WATER RETURN PIPING
- CHWS — CHILLED WATER SUPPLY PIPING
- CHWR — CHILLED WATER RETURN PIPING
- HCWS — HOT/CHILLED WATER SUPPLY PIPING
- HCWR — HOT/CHILLED WATER RETURN PIPING
- HPWS — WATER SOURCE HEAT PUMP SUPPLY
- HPWR — WATER SOURCE HEAT PUMP RETURN
- MU — MAKE-UP(NON-POTABLE)
- HMU — MAKE-UP(NON-POTABLE)HOT
- LPS — LOW PRESSURE STEAM (0–15 PSI) PIPING
- MPS — MEDIUM PRESSURE STEAM (16–50 PSI) PIPING
- HPS — HIGH PRESSURE STEAM (51 PSI & OVER) PIPING
- LPR — LOW PRESSURE CONDENSATE RETURN (0–15 PSI) PIPING
- MPR — MEDIUM PRESSURE CONDENSATE RETURN (16–50 PSI) PIPING
- HPR — HIGH PRESSURE CONDENSATE RETURN (51 PSI & OVER) PIPING
- HRS — HEAT RECOVERY SUPPLY PIPING
- HRR — HEAT RECOVERY RETURN PIPING
- FOS — FUEL OIL SUPPLY PIPING
- FOR — FUEL OIL RETURN PIPING
- FOV — FUEL OIL VENT PIPING
- RS — REFRIGERANT SUCTION PIPING
- RL — REFRIGERANT LIQUID PIPING
- D — EQUIPMENT OR SYSTEM DRAIN PIPING
- E — EXPANSION LINE
- R — SAFETY OR RELIEF VALVE DISCHARGE PIPING

- CD — CONDENSATE DRAIN PIPING
- G — NATURAL GAS PIPING
- S — EXISTING SANITARY SEWER PIPING (SITE)
- SS — EXISTING STORM SEWER PIPING (SITE)
- S — SANITARY SEWER PIPING (SITE)
- SS — STORM SEWER PIPING (SITE)
- SOIL & WASTE PIPING
- DWV VENT PIPING
- RL — ROOF LEADER PIPING
- FD — FOUNDATION DRAIN PIPING
- DOMESTIC COLD WATER PIPING
- DCW
- DOMESTIC HOT WATER (125 F) PIPING
- DHW
- DOMESTIC RECIRCULATING HOT WATER PIPING
- DRW
- W — WATER SERVICE PIPING (EXTERIOR)
- V — VENT PIPING
- VALVE (IN GENERAL – SEE SPECS)
- GATE VALVES (GV)
- GLOBE VALVES
- CHECK VALVE
- BALL VALVES (BV)
- PLUG COCKS, BALANCING COCKS
- STRAINER; STRAINER WITH BLOW DOWN.
- FLEXIBLE CONNECTOR
- BACKFLOW PREVENTER, REDUCED PRESSURE (STRAINER NOT SHOWN) (BFP – RPZ)
- DOUBLE CK. VALVE ASSEMBLY (DCA)
- REDUCING BUSHING
- COUPLING, JOINT
- CAP
- PLUG
- 90° ELBOW
- 90° ELBOW TURNED UP
- 90° ELBOW TURNED DOWN
- 45° ELBOW
- TEE OR SIDE CONNECTION
- TEE OUTLET UP
- TEE OUTLET DOWN
- CROSS
- TOP / BOT. — UNCONNECTED CROSSING PIPES
- RISE OR DROP IN PIPE
- LPS — RISER ONLY, SERVICE (LPS) SHOWN
- BOTTOM CONNECTION TO LINE
- TOP CONNECTION TO LINE
- RISER IN SLEEVE
- UNION
- STRUCTURAL PIPE ANCHOR
- BUILDING ENTRANCE PIPE ANCHOR

- PIPE GUIDE
- EXPANSION JOINT
- THRUST BLOCK
- WALL SLEEVE
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- VTR / VTR — VENT THROUGH ROOF, PLAN & RISER
- THROUGH ROOF
- THROUGH FLOOR
- THROUGH WALL
- T — THERMOMETERS
- THERMOMETER WELL
- P — PRESSURE GAUGES
- V / C — VACUUM AND COMPOUND GAUGES
- P/T — PRESSURE/TEMPERATURE TEST PLUG
- FS — FLOW SWITCH
- M — METER: WATER, CONDENSATE OR GAS
- T T — THERMOSTAT, OR TEMP. CONTROLLER
- SPRINKLER HEAD: UPRIGHT OR GENERAL
- SPRINKLER HEAD: PENDANT ON DROP NIPPLE

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Mechanical Legend

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FREEMAN LAKE PARK
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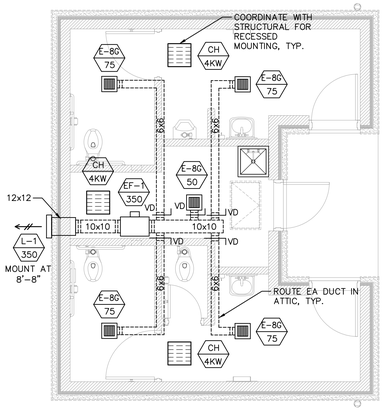
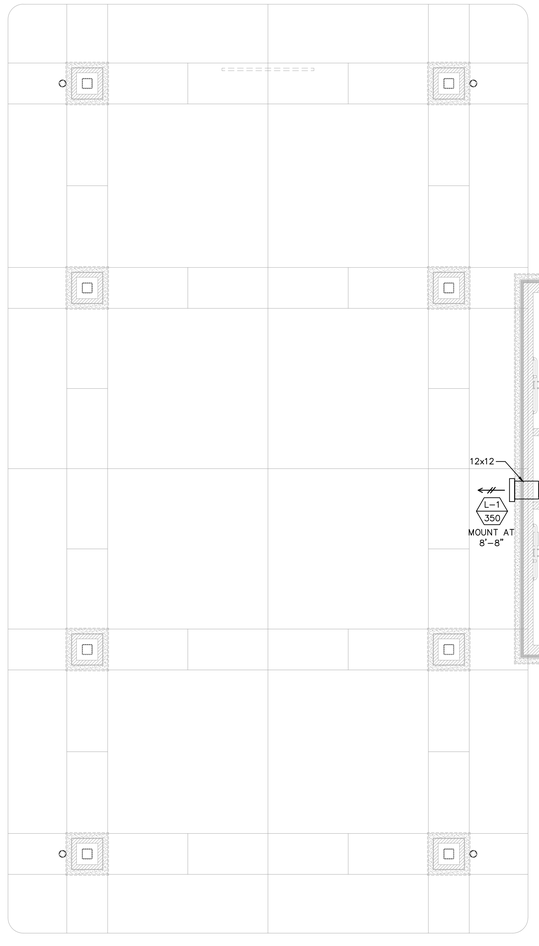
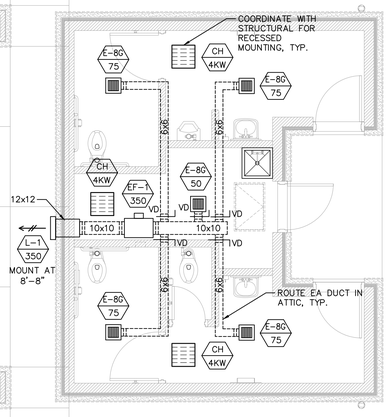


MECHANICAL PLAN - RESTROOM

1/4" = 1'-0"





MECHANICAL PLAN - PAVILION

1/4" = 1'-0"

HVAC GENERAL NOTES:

A. ALL RECTANGULAR AND ROUND DUCTS SHALL BE SIZED AS SHOWN ON THE DRAWINGS. DUCT SIZES SHOWN ARE FREE AREA SIZES AND THE CONTRACTOR SHALL MAKE ALLOWANCES TO INCLUDE EXTERNAL INSULATION PER THE SPECIFICATIONS.

B. ALL RECTANGULAR AND ROUND DUCTWORK SHALL BE FABRICATED USING MILD GALVANIZED SHEET METAL. FIBERGLASS DUCTBOARD IS PROHIBITED. FLEXIBLE DUCT MAY BE USED FOR DIFFUSER RUNOUTS AND MUST BE INSTALLED IN STRAIGHT RUNS WITH MINIMUM TURNING AND SAGGING. FLEXIBLE DUCT INSTALLED WITH UNNECESSARY OR EXCESSIVE TURNS OR SAGS WILL BE RE-INSTALLED TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE AT NO ADDITIONAL COST.

C. ALL DUCTWORK SHALL BE FABRICATED AND INSTALLED ACCORDING TO THE MOST RECENTLY PUBLISHED ASHRAE AND SMACNA STANDARDS. ROUTE DUCTWORK AS HIGH AS POSSIBLE.

D. INSTALL TURNING VANES IN ALL RECTANGULAR DUCT ELBOWS.

E. MANUFACTURER'S MINIMUM CLEARANCE RECOMMENDATIONS SHALL BE MAINTAINED ON ALL EQUIPMENT AND DUCTWORK.

F. FINAL TESTING AND BALANCING SHALL BE PERFORMED IN COMPLETE ACCORDANCE WITH AABC STANDARDS. THE CONTRACTOR SHALL PROCURE THE SERVICES OF AN INDEPENDENT COMPANY, THE COMPANY SHALL BE EQUIPPED AND HAVE THE QUALIFIED TECHNICAL PERSONNEL AS REQUIRED BY AABC OR NEBB. THE AIR BALANCE REPORT SHOWS DESIGN AND MEASURED AIR QUANTITIES, STATIC PRESSURES, FAN MOTOR RPM AND MOTOR CURRENT. DEVIATION BETWEEN DESIGN AND MEASURED QUANTITIES SHALL NOT BE GREATER THAN 10%.

GENERAL SHEET NOTES

A. CONTRACTOR TO BE RESPONSIBLE FOR ALL FINAL DIMENSIONS.

B. CONTRACTOR SHALL NOT CUT ANY BUILDING STRUCTURAL MEMBER WITHOUT WRITTEN APPROVAL FROM THE STRUCTURAL ENGINEER.

C. CONTRACTOR TO COORDINATE WORK SCHEDULE WITH OTHER TRADES AND OWNER.

D. CONTRACTOR TO COORDINATE ALL NEW WORK SO AS NOT TO DAMAGE ANY EXISTING OR NEW EQUIPMENT.

E. CONTRACTOR SHALL VERIFY ELECTRICAL CHARACTERISTICS OF ALL EQUIPMENT PRIOR TO INSTALLING SAME.

F. ALL WORK AREAS TO BE CLEANED AT THE END OF EACH WORK DAY.

G. CONTRACTOR TO COORDINATE ALL PIPING, ELECTRICAL CONDUIT, DUCTWORK, ROOF OPENINGS, AND EQUIPMENT PLACEMENT AND OTHER WORK WITHIN ALL TRADES.

H. SEE STRUCTURAL DRAWINGS AND SPECIFICATIONS FOR LINTELS, BEAMS, AND JOISTS.

I. ANY HEATING/COOLING SYSTEM 2000 CFM OR GREATER TO BE MONITORED W/SMOKE DETECTION IN S.A. DUCT SO SYSTEMS FAN WILL BE SHUT DOWN AS PER NFPA.

J. PROVIDE "FRESH OUTSIDE AIR" AS REQUIRED BY INTERNATIONAL MECHANICAL CODES.

K. PROVIDE COMPLETE SYSTEM AS COORDINATED WITH GC AND OTHER TRADES AND IN ACCORDANCE WITH CURRENT IMC AND ASHRAE 62 STANDARDS. ALL SYSTEMS MUST BE FURNISHED AND INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS, KENTUCKY BUILDING CODE AND NFPA. ALL ELECTRICAL AND PLUMBING REQUIREMENTS RELATED TO HVAC TO BE COORDINATED BY THIS SUBCONTRACTOR WITH ELECTRICIAN AND PLUMBER. ALL CONTROL WIRING FOR HVAC EQUIPMENT MUST BE INSTALLED BY THE HVAC SUBCONTRACTOR.

L. MANUFACTURERS MIN CLEARANCES TO BE MAINTAINED ON ALL EQUIPMENT AND DUCTWORK.

M. COORDINATE ALL ROOF & WALL PENETRATIONS WITH ARCHITECT.

THERMOSTAT NOTES:

LOCATE THERMOSTAT BESIDE LIGHT SWITCH IN AREAS OF CONFLICT, WHERE BOTH DEVICES ARE SHOWN.

ROOF AND WALL PENETRATION NOTE:

COORDINATE ALL OPENINGS WITH ARCHITECT BEFORE INSTALLING DUCTWORK OR CUTTING THE ROOF OR WALLS.

SHEET LEGEND

CU	CONDENSING UNIT
HPU	HEAT PUMP UNIT
AHU	AIR HANDLING UNIT
	DUCTWORK
	SUPPLY PIPING
	RETURN PIPING
	SUPPLY DUCT
	RETURN DUCT
	GATE VALVE
	BALL VALVE
	THERMOSTAT
	PUMP
	PRESSURE AND TEMPERATURE VALVE
	UNION
FD	FIRE DAMPER
VD	VOLUME DAMPER
CD	CONDENSATE DRAIN
R	REFRIGERATION LINE SET

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COMMONWEALTH OF KENTUCKY
WILLIAM GREGORY WILSON
17178
LICENSED PROFESSIONAL ENGINEER
STATE OF PROFESSIONAL ENGINEERS

Mechanical Plans

CITY OF ELIZABETHTOWN
FREEMAN LAKE PARK
ELIZABETHTOWN, KENTUCKY

CONSTRUCTION DOCUMENTS

Issue Date:	DEC 22, 2023
Drawn By:	STAFF
Checked By:	WGWILSON
Revisions:	

Mark	Date

AHU SEAL

Project Number
21049.05

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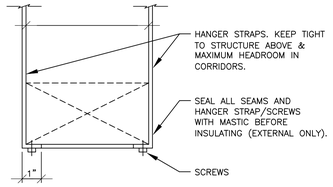
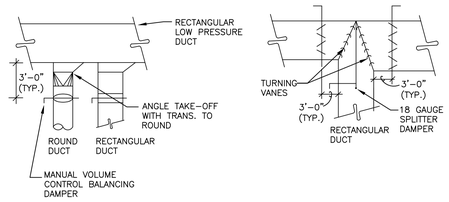
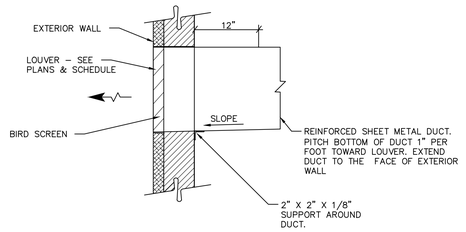
M-101



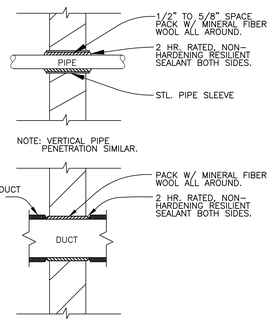
1 DUCT HANGING DETAIL
N.T.S.



2 BRANCH TAKE OFF DUCTWORK DETAIL
N.T.S.

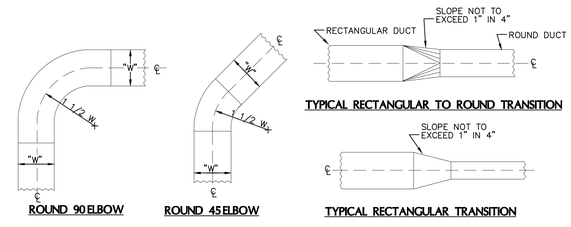


3 EXHAUST LOUVER DETAIL
N.T.S.



TYP. FOR PENETRATIONS OF RATED WALLS. DETAIL IS SIMILAR FOR NONRATED WALLS EXCEPT SEALANT CAN BE NONRATED.

4 PENETRATIONS THROUGH WALL DETAIL
N.T.S.



ROUND 90 ELBOW | ROUND 45 ELBOW | TYPICAL RECTANGULAR TO ROUND TRANSITION | TYPICAL RECTANGULAR TRANSITION

INSTALLATION NOTES

1. ALL DUCTS SHALL BE CONSTRUCTED AND ERECTED IN A NEAT AND WORKMANLIKE MANNER.
2. DUCTS SHALL BE CONSTRUCTED OF THE WEIGHTS, GAGES, AND MATERIAL AS SPECIFIED.
3. THE DIMENSIONS SHOWN FOR ALL DUCTS SHOWN IN PLAN GIVE THE WIDTH FIRST AND THEN THE HEIGHT.
4. DUCTS SHALL BE SECURELY ATTACHED TO THE BUILDING IN AN APPROVED MANNER.
5. DIVERGING TRANSITION PIECES SHALL BE MADE AS GRADUAL AS POSSIBLE.
6. ACCESS PANELS SHALL BE INSTALLED BEFORE AND/OR AFTER EQUIPMENT INSTALLED IN THE DUCT.
7. JOINTS AND SEAMS OF SUPPLY DUCTS SHALL BE SECURELY FASTENED, SEALED, AND MADE AIR TIGHT.

5 LOW PRESSURE DUCTWORK DETAILS
N.T.S.

GRILLE & DIFFUSER SCHEDULE									
MARK	MANUFACTURER TYPE & MODEL	DEVICE SIZE	INLET SIZE	MAX CFM	S.P.	OBD	COLOR	MOUNTING	NOTE
E-8G	METALAIRE H4002	16x16	6X6	200	.04	NO	WHITE	SURFACE	8

NOTES:
1. PROVIDE FLEXMASTER SPIN-IN TAKE OFF WITH SCOOP & DAMPER. PROVIDE MANUAL VOLUME DAMPERS AND ADJUST DIFFUSERS AS SHOWN ON DRAWINGS.
2. 1/2"x1/2"x1" CUBE CORE.
3. DIFFUSER TO BE LOUVERED FACE.
4. PROVIDE FIRE DAMPER.
5. OBD TO BE OPERABLE FROM FACE.
6. PROVIDE ADJUSTABLE DEFLECTION BLADES, VOLUME DAMPER, GASKETING AND DUCT EXTENSION BOX. SEE DETAILS.
7. PROVIDE FILTER GRILLE ACCESORY.
8. ALUMINUM.

LOUVER SCHEDULE	
DESIGNATION	L-1
MANUFACTURER	GREENHECK
MODEL #	ESJ-401
SIZE	12x12
MATERIAL	EXT. ALUMINUM
TYPE	EXHAUST
CFM, SP	350 CFM, 0.1"SP
NOTES:	1,2,3,4,5

NOTES:
1. PROVIDE INSECT SCREEN AND BIRD SCREEN.
2. COLOR BY ARCHITECT.
3. STORM PROOF.
4. BACKDRAFT DAMPER.
5. PROVIDE MOTORIZED DAMPER.
6. DO NOT EXCEED 805 FPM.

EXHAUST FAN SCHEDULE		
DESIGNATION	EF-1	
MANUFACTURER	GREENHECK	
MODEL NUMBER	SQ-95-G	
STATIC PRESSURE	0.25"	
AIRFLOW	350 CFM	
HP/WATTS	1/15 HP	
SONES, MAX	6.4 SONES	
RPM	1,300 RPM	
VOLTS/PHASE/HZ	120/1/60	
MOUNTING	IN-LINE	
NOTES:	1,2,3,4,5,6,7,8,9,10	

ACCESSORIES & NOTES:
1. WIRE BY DIVISION 26.
2. PROVIDE GRAVITY BACKDRAFT DAMPER.
3. PROVIDE WITH DISCONNECT.
4. PROVIDE NEOPRENE BOOT AT PENETRATION.
5. PROVIDE WITH SPEED CONTROLLER, CONCEALED AT EF.
6. SEE DETAILS FOR FURTHER REQUIREMENTS.
7. PROVIDE TO LOCAL LIGHTING FOR OPERATION, UNLESS OTHERWISE NOTED.
8. PROVIDE WITH HANGING VIBRATION ISOLATORS.
9. PROVIDE ALUMINUM CONSTRUCTION.
10. PROVIDE HANGING ISOLATORS & IN LINE DUCT COLLARS.

ELECTRIC CEILING HEATER SCHEDULE		
DESIGNATION	CH-4KW	
MANUFACTURER	MARKEL	
MODEL NUMBER	H3484-A1	
KW RATING	4.0 KW	
BTUH	13,600 BTUH	
AIR RISE	30°F	
ELECTRICAL	240/1/60	
MIN. CIRCUIT AMPS	16.8 AMPS	
MOCP	20 MOCP	
AIRFLOW	600 CFM	
WEIGHT	50 LBS	
SIZE	23.8"SQ x 9.125"H	
ACCESSORIES	1,2,3,4,5	

ACCESSORIES & NOTES:
1. PROVIDE WITH THERMOSTAT, BUILT-IN.
2. PROVIDE WITH INTEGRAL DISCONNECT SWITCH.
3. PROVIDE T-BAR MOUNTING AND LOUVER OUTLET DIFFUSER.
4. PROVIDE 1/2" GYPSUM PLASTER FLANGE, WHITE FINISH.
5. PROVIDE RECESSED FRAME, FIELD VERIFIED.

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ELECTRICAL LEGEND

POWER

- MAIN SWITCHBOARD, DISTRIBUTION BOARD OR MOTOR CONTROL CENTER
- PANELBOARD, SURFACE MOUNTED
- PANELBOARD, FLUSH MOUNTED
- ELECTRICAL MOTOR CONNECTION
- (J) JUNCTION BOX, MOUNTED ON OR ABOVE ACCESSIBLE CEILING UON
- (J)H JUNCTION BOX, RECESSED WALL MOUNTED, +18" UON.
- [J] JUNCTION BOX, FLOOR MONUMENT TYPE.
- DUPLEX CONVENIENCE RECEPTACLE OUTLET, MOUNT +18"AFF UON.
- IG DUPLEX RECEPTACLE OUTLET, MOUNT 18" AFF UON FOR COMPUTER LOAD.
- DOUBLE DUPLEX CONVENIENCE RECEPTACLE OUTLET, MOUNT +18"AFF UON. ONE DUPLEX FOR COMPUTER LOADS PLUS ONE DUPLEX FOR CONVENIENCE LOADS.
- II DOUBLE DUPLEX ISOLATED GROUND RECEPTACLE OUTLET, MOUNT +18"AFF UON. SEE ALSO GENERAL NOTES 1 AND 2 ON THIS SHEET.
- C DUPLEX CONVENIENCE RECEPTACLE OUTLET FLUSH MOUNTED IN CEILING.
- DUPLEX CONVENIENCE RECEPTACLE OUTLET MOUNTED ABOVE COUNTER, +42" UON.
- GFI DUPLEX CONVENIENCE RECEPTACLE OUTLET WITH GROUND FAULT INTERRUPTER
- WP/GFI WEATHERPROOF, DUPLEX CONVENIENCE RECEPTACLE OUTLET WITH GROUND FAULT INTERRUPTER.
- COMBINATION ELECTRIC AND COMMUNICATION FLOOR BOX WITH RECESSED OUTLETS, AND FLUSH LIFT UP COVER FOR CONCEALED SERVICE. SEE "DV" AND "AV" FLOOR PLANS FOR ADDITIONAL LOCATIONS.
- PB PULLBOX, SIZE AND TYPE AS SPECIFIED BY NUMBERED NOTE
- AF SAFETY DISCONNECT SWITCH, 3 POLE UON

A:	30A NON-FUSED	AF:	30A FUSED
B:	60A NON-FUSED	BF:	60A FUSED
C:	100A NON-FUSED	CF:	100A FUSED
D:	200A NON-FUSED	DF:	200A FUSED
E:	400A NON-FUSED	FF:	400A FUSED

- 2 ENCLOSED MAGNETIC STARTER, FVNR UON, NUMBER INDICATES NEMA SIZE (NEMA 1 UON)
- 2 COMBINATION MAGNETIC STARTER, FVNR UON, NUMBER INDICATES NEMA SIZE (NEMA 1 UON)
- CONNECTION TO EQUIPMENT
- 2" CONDUIT SLEEVE
- $ SINGLE POLE TOGGLE SWITCH
- $2 DOUBLE POLE TOGGLE SWITCH
- $3 THREE-WAY TOGGLE SWITCH
- $D DIMMER SWITCH
- $F FAN SPEED CONTROL
- $K KEY OPERATED SWITCH
- $OS MOTION SENSOR SWITCH
- $P TOGGLE SWITCH WITH PILOT LIGHT
- $T MANUAL STARTER WITH THERMAL OVERLOAD PROTECTION AND CONTROL RELAY. INSTALL NEAR MOTOR. SEE SINGLE PHASE MOTOR CONNECTION DETAIL.
- (M) CEILING MOUNTED MOTION SENSOR
- (P) PHOTOCELL

RACEWAYS

- CONDUIT AND WIRE RUN CONCEALED IN WALL OR CEILING SPACE, OR RUN EXPOSED IN UNFINISHED SPACE. MIN. CONDUIT SIZE 3/4"C.
- CONDUIT AND WIRE RUN EXPOSED ON WALL OR CEILING IN FINISHED SPACE.
- CONDUIT AND WIRE RUN UNDER SLAB OR UNDERGROUND.
- CONDUIT AND WIRE HOMERUN, CONTINUOUS RUN TO PANELBOARD OR EQUIPMENT CABINET. HASH MARKS INDICATE NUMBER OF WIRES.
- T TELEPHONE SYSTEM CONDUIT, MINIMUM 1-1/4", WITH PULLWIRE
- L LOW VOLTAGE LIGHTING SYSTEM CONTROL CABLE. RUN CONCEALED IN WALL OR IN CEILING SPACE UON
- CONDUIT TURNED UP
- CONDUIT TURNED DOWN
- CABLE TRAY, LADDER TYPE, ALUMINUM CONSTRUCTION
- M MULTI-OUTLET ASSEMBLY
- FA FIRE ALARM SYSTEM WIRING
- SMR SURFACE METAL RACEWAY
- OHE OVERHEAD ELECTRIC
- UE UNDERGROUND ELECTRIC
- UP UNDERGROUND ELECTRIC-PRIMARY
- UC UNDERGROUND COMMUNICATIONS
- UL STREET LIGHTING CIRCUIT

SIGNAL

- COMMUNICATIONS TELEPHONE TERMINAL BOARD, FIRE RATED
- FOUR PORT TELE/DATA OUTLET, MOUNT +18" AFF UON. INCLUDES 4-11/16" SQ. x 2-1/8" DEEP OUTLET BOX WITH SINGLE GANG RING AND 1"C. FROM BOX UP IN WALL AND RUN TO CABLE TRAY.
- D SAME AS ABOVE EXCEPT TWO PORT DATA OUTLET.
- FLUSH FLOOR BOX, FOUR TELE/DATA OUTLET WITH 1"C. RUN UP IN WALL & TO CABLE TRAY.
- TELEPHONE OUTLET, INCLUDES OUTLET BOX, SINGLE GANG RING AND 1"C FROM BOX UP IN WALL AND RUN TO CABLE TRAY ("W" = WALL MOUNTED +48"; "P" = PUBLIC TELEPHONE, WALL MOUNTED +48"; "F" = FIREMAN'S TELEPHONE, WALL MOUNTED +48")
- COMBINATION POKE THROUGH FITTING WITH DUPLEX RECEPTACLE AND TELE/DATA OUTLETS, 3/4"C TO TELE/DATA ROOM ON SAME FLOOR. SEE ALSO POWER LEGEND THIS SHEET.
- (S) SMOKE DETECTOR, SURFACE MOUNTED ON CEILING, TILE BRIDGE
- (S)D SMOKE DETECTOR, DUCT MOUNTED (SA = SUPPLY AIR)
- H HEAT DETECTOR, SURFACE MOUNTED ON CEILING, TILE BRIDGE
- F FIRE ALARM MANUAL PULL STATION, +48" AFF.
- F FIRE ALARM VISUAL STROBE, WALL MOUNT AT +80" OR 6" BELOW CEILING TO BOTTOM OF LENS, WHICHEVER IS LOWER.
- F FIRE ALARM COMBINATION HORN/STROBE, WALL MOUNT AT +80" AFF OR 6" BELOW CEILING TO BOTTOM OF LENS.
- FACP FIRE ALARM CONTROL PANEL
- FS SPRINKLER SYSTEM FLOW SWITCH CONNECTION
- TS SPRINKLER SYSTEM TAMPER SWITCH CONNECTIONS
- DCV SPRINKLER SYSTEM DOUBLE CHECK VALVE SWITCH CONNECTIONS.
- CONNECTION TO DUCT SMOKE DAMPER
- D FIRE ALARM CONNECTION TO MAGNETIC DOOR HOLD OR MAGNETIC DOOR LOCK. PROVIDE SMOKE DETECTORS ON EACH SIDE OF DOOR OPENING.
- ST SMOKE DETECTOR WITH THERMAL ELEMENT
- P ADA ADA PUSH PAD DOOR OPERATOR, 44" AFF.
- PIV SPRINKLER SYSTEM POST INDICATOR VALVE CONNECTIONS
- ANN REMOTE ANNUCIATOR PANEL, RECESSED
- R FIRE ALARM BEAM DETECTOR WITH TRANS/RECEIVE HARDWARE AND REFLECTOR AT OPPOSITE END OF BEAM
- SP 8" ROUND LAY-IN SPEAKER WITH TILE BRIDGE AND BACKBOX. MOUNT AT 7'-9" AFF TO CENTER.
- SP 8" SQUARE SURFACE MOUNTED SPEAKER WITH BACKBOX AND ENCLOSURE. MOUNT AT 7'-9" AFF TO CENTER.

GENERAL LEGEND

- 1 NUMBERED SHEET NOTES: REFERS TO NOTES ON SAME SHEET AS REFERENCE
- GN 1 NUMBERED GENERAL NOTES: REFERS TO NOTES ON THIS SHEET (E0.1)
- EF-2 EQUIPMENT IDENTIFICATION TAG
- P2 CABLE AND/OR RACEWAY TAG P = POWER, F = HV FEEDER, T = TELEPHONE SEE THIS SHEET FOR SCHEDULE
- LIGHT # OR a,b INDICATES SWITCH OR CIRCUIT CONNECTION A INDICATES FIXTURE SCHEDULE TYPE
- EMERGENCY LIGHT
- WALL MOUNTED LIGHT, SURFACE
- EMERGENCY WALL MOUNTED LIGHT
- RECESSED LIGHT
- EMERGENCY RECESSED LIGHT
- STRIP LIGHT
- EMERGENCY STRIP LIGHT
- EXIT SIGN - SINGLE/DOUBLE FACE
- HIGH BAY
- EMERGENCY HIGH BAY

ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
C	CONDUIT
CKT	CIRCUIT
CB	CIRCUIT BREAKER
CT	CURRENT TRANSFORMER
EM	EMERGENCY
(E)	EXISTING
FLUOR	FLUORESCENT
FVNR	FULL VOLTAGE NON-REVERSING
F	FUSED
G, GND	GROUND
GFI	GROUND FAULT INTERRUPTER
HID	HIGH INTENSITY DISCHARGE
IC	INTERRUPTING CAPACITY
JB	JUNCTION BOX
LCP	LIGHTING CONTROL PANEL
MCC	MOTOR CONTROL CENTER
N, NEUT	NEUTRAL
(N) NL	NEW NIGHT LIGHT (UNSWITCHED)
NTS	NOT TO SCALE
OL	OVERLOAD RELAY
PNL	PANELBOARD
PB	PUSHBUTTON SWITCH
PC	PHOTOCELL
PIV	POST INDICATING VALVE
PT	POTENTIAL TRANSFORMER
(R)	EXISTING RELOCATED
RS	RIGID STEEL
SMR	SURFACE METAL RACEWAY
SN	SHEET NOTE
TYP.	TYPICAL
UON	UNLESS OTHERWISE NOTED
VFD	VARIABLE FREQUENCY DRIVE
WP	WEATHERPROOF
XFMR	TRANSFORMER

GENERAL NOTES

1. MINIMUM STANDARDS FOR ALL ELECTRICAL WORK SHALL BE THE LATEST REVISION OF THE NATIONAL ELECTRICAL CODE (NEC). WHENEVER AND WHEREVER OSHA, FEDERAL AND STATE LAWS, REGULATIONS AND DESIGN CRITERIA REQUIRE HIGHER STANDARDS THAN NEC, THESE LAWS, REGULATIONS, AND DESIGN CRITERIA SHALL BE FOLLOWED.
2. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS. ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND CONTRACT DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE ANY WORK RELATING TO THOSE CONDITIONS ARE PERFORMED.
3. UNLESS INDICATED OTHERWISE, INSTALL ALL WIRING IN RIGID METAL CONDUIT, ELECTRICAL METALLIC TUBING, FLEXIBLE CONDUIT OR SURFACE METAL RACEWAY AS SPECIFIED. ALL CONDUIT SHALL BE 3/4" OR LARGER.
4. DO NOT INSTALL ELECTRICAL METALLIC TUBING UNDERGROUND, ON GRADE OR IN WET LOCATIONS, INHAZARDOUS AREAS, OR FOR CIRCUITS OPERATING AT MORE THAN 600 VOLTS. METALLIC CONDUIT BURIED IN GROUND SHALL BE TREADED, RIGID STEEL CONDUIT ONLY. SCHEDULE 40 PVC MAY BE USED UNDERGROUND OR BELOW SLAB ON GRADE PROVIDED ALL RISERS THROUGH THE SLAB ARE MADE WITH RIGID STEEL CONDUIT.
5. UNLESS INDICATED OTHERWISE, PROVIDE NO. 12 AWG THWN OR LARGER FOR ALL BRANCH CIRCUIT CONDUCTORS. ALL CONDUCTORS SHALL BE 98% CONDUCTIVITY COPPER.
6. ALL ELECTRICAL EQUIPMENT SHALL BE UL LISTED FOR THE APPLICATION FOR WHICH IT IS UTILIZED.
7. ALL CONDUIT SHALL BE INSTALLED CONCEALED EXCEPT IN DESIGNATED MECHANICAL ROOMS OR UNLESS INDICATED OTHERWISE HEREIN. EXPOSED SURFACE MOUNTED RACEWAY IS SHOWN OR OTHERWISE REQUIRED IT SHALL BE TYPE SMR, PAINTED TO MATCH FINISH ON WHICH IT IS INSTALLED.
8. A SEPARATE, INSULATED EQUIPMENT GROUND WIRE SHALL BE RUN CONTINUOUS TO ALL EQUIPMENT, LIGHTING FIXTURES AND RECEPTACLES.
9. UNLESS INDICATED OTHERWISE, ALL INTERIOR AND EXTERIOR WIRING DEVICES SHALL BE INSTALLED FLUSH IN WALL. ELECTRICAL BOX LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE UNLESS DIMENSIONED; COORDINATE LOCATION WITH EQUIPMENT SERVED, ELEVATIONS AND DIMENSIONED FLOOR PLANS.
10. ALL EQUIPMENT DISCONNECT SWITCHES, MOTOR STARTERS, PUSHBUTTON STATIONS, PANELBOARDS AND SWITCHBOARDS SHALL BE CLEARLY IDENTIFIED USING ENGRAVED LAMACOID PLATES AS SPECIFIED.
11. UNLESS INDICATED OTHERWISE, LOCATE STARTER WITHIN SIGHT OF THEIR ASSOCIATED MOTORS. WHERE STARTER IS NOT WITHIN SIGHT OF MOTOR, PROVIDE A DISCONNECT DEVICE WITHIN SIGHT OF THE MOTOR.
12. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL POWER WIRING TO ALL MOTORS AND ALL LINE VOLTAGE FEEDERS TO ALL FACTORY CONTROL PANELS FURNISHED UNDER DIVISION 15. THE ELECTRICAL CONTRACTOR SHALL ALSO PROVIDE MOTOR STARTERS (3-PHASE) OR MOTOR RELAYS (SINGLE PHASE) AND DISCONNECTS FOR ALL MECHANICAL EQUIPMENT WHICH HAS NOT BEEN SPECIFIED TO HAVE FACTORY CONTROL PANELS OR FACTORY-MOUNTED MOTOR CONTROLS.
13. IDENTIFY CIRCUITS CONTAINED IN EACH JUNCTION BOX ON EXTERIOR COVER WITH A PERMANENT MARKER. TAG EACH CONDUCTOR INSIDE.
14. CHECK WITH OTHER TRADES ON SCOPE OF THEIR WORK AND COORDINATE ON ALL LOCATIONS OF VARIOUS ITEMS OF EQUIPMENT AND OUTLETS BEFORE THEY ARE FINALLY PLACED AND CONNECTED. RELOCATION OF MATERIAL OR EQUIPMENT NECESSITATED BY FAILURE TO COORDINATE WORK SHALL BE AT NO COST TO THE OWNER.
15. PROVIDE FIRESTOPPING AT ALL FIRE SEPARATION WALLS AND FLOOR PENETRATIONS.
16. WHERE TWO SWITCHES ARE SHOWN TO CONTROL A SINGLE OR GROUP OF LIGHT FIXTURES, DUAL SWITCHING SHALL BE PROVIDED, ALL CENTER OR CENTER PAIR OF LAMPS SHALL BE SWITCHED TOGETHER AND ALL OUTSIDE PAIR OF LAMPS SHALL BE SWITCHED TOGETHER.
17. ALL FINAL LOCATIONS AND ARRANGEMENTS OF LIGHTING FIXTURES SHALL BE OBTAINED AND COORDINATED WITH THE ARCHITECTURAL REFLECTED CEILING PLANS.
18. ALL SPRINKLER SYSTEM VALVES SHALL BE SUPERVISED, COORDINATE LOCATION OF ALL VALVE SUPERVISORY AND FLOW SWITCHES WITH APPROVED SPRINKLER SYSTEM SHOP DRAWINGS PRIOR TO ROUGH-IN.
19. ALL EQUIPMENT, DEVICES AND FIXTURES LOCATED OUTDOORS SHALL BE UL LISTED FOR USE IN WET LOCATIONS OR INSTALLED IN A NEMA 3R ENCLOSURE.
20. ALL RECEPTACLES LOCATED ON BUILDING EXTERIOR, WITHIN 6' OF SINKS, ON ROOFS, ELEVATOR PITS OR AS OTHERWISE REQUIRED BY NEC SHALL BE PROVIDED WITH GROUND FAULT PROTECTION.

NOTES:

FOR MULTIPLE FEEDERS, SIZE OF EACH GROUND WIRE SHALL BE UPSIZED FOR CIRCUIT BREAKER SIZE PER SECTION 250-95:

C.B. SIZE	GROUND WIRE
400A	#2
600A	#1
800A	#1/0
1000A	#2/0
2000A	250MCM

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Electrical Legend

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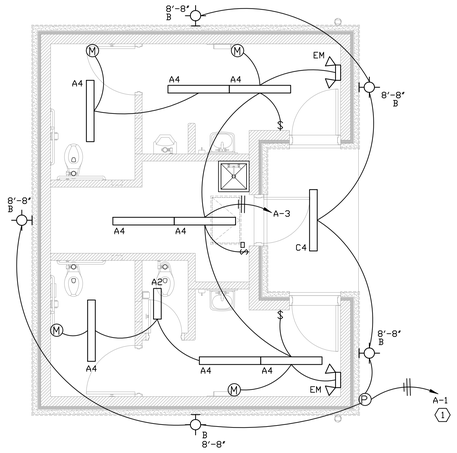
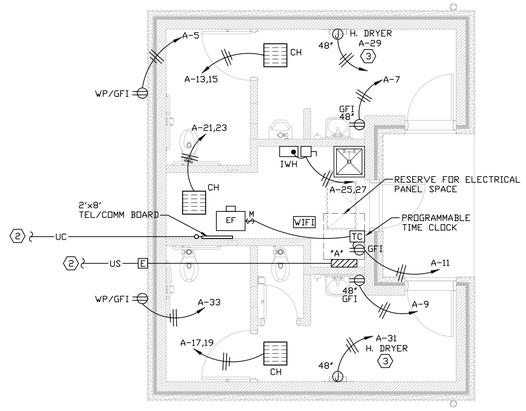


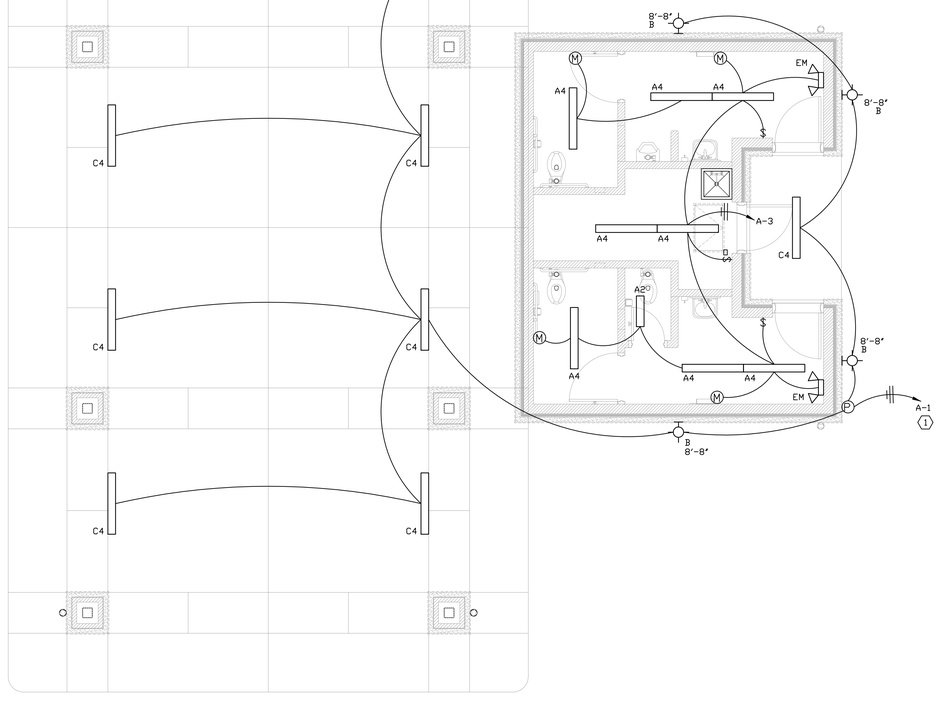
LIGHTING PLAN – RESTROOM

1/4" = 1'-0"



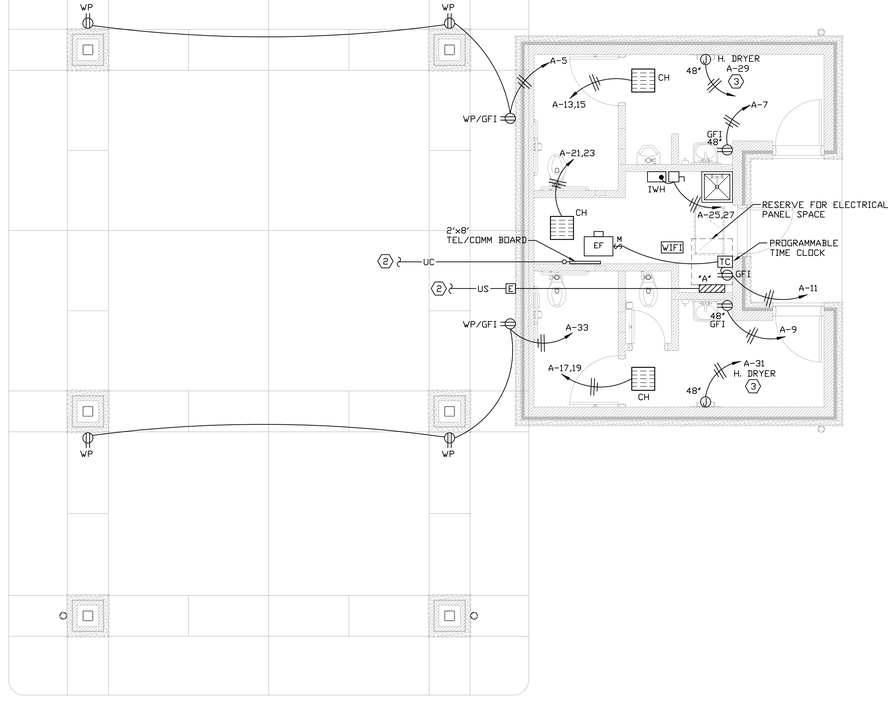
POWER/COMM PLAN – RESTROOM

1/4" = 1'-0"



LIGHTING PLAN – PAVILION

1/4" = 1'-0"



POWER/COMM PLAN – PAVILION

1/4" = 1'-0"

GENERAL SHEET NOTES

A. CONTRACTOR TO BE RESPONSIBLE FOR ALL FINAL DIMENSIONS.

B. CONTRACTOR SHALL NOT CUT ANY BUILDING STRUCTURAL MEMBER WITHOUT WRITTEN APPROVAL FROM THE STRUCTURAL ENGINEER.

C. CONTRACTOR TO COORDINATE WORK SCHEDULE WITH OTHER TRADES AND OWNER.

D. CONTRACTOR TO COORDINATE ALL NEW WORK SO AS NOT TO DAMAGE ANY EXISTING OR NEW EQUIPMENT.

E. CONTRACTOR SHALL VERIFY ELECTRICAL CHARACTERISTICS OF ALL EQUIPMENT PRIOR TO INSTALLING SAME.

F. ALL WORK AREAS TO BE CLEANED AT THE END OF EACH WORK DAY.

G. CONTRACTOR TO COORDINATE ALL PIPING, ELECTRICAL CONDUIT, DUCTWORK, ROOF OPENINGS, AND EQUIPMENT PLACEMENT AND OTHER WORK WITHIN ALL TRADES.

H. THIS CONTRACTOR IS RESPONSIBLE FOR SEALING ALL OPENINGS LEFT BY THE REMOVAL OF EQUIPMENT.

I. SEE MECHANICAL PLANS FOR LOW VOLTAGE INTERLOCKING OF LOUVERS, DAMPERS, FANS, AND CONTROLS.

CODED SHEET NOTES:

(1) WIRE THROUGH LIGHTING PHOTOCELL.

(2) SEE SITE UTILITIES PLAN FOR CONTINUATION.

(3) EXCELATOR XL, 1500 WATT, HAND DRYER, 120 VOLTS OR EQUAL.

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COMMONWEALTH OF KENTUCKY
WILLIAM GLENN WILSON
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Electrical Plans

CITY OF ELIZABETHTOWN
FREEMAN LAKE PARK
ELIZABETHTOWN, KENTUCKY

CONSTRUCTION DOCUMENTS

Issue Date:	DEC 22, 2023
Drawn By:	STAFF
Checked By:	WGWILSON
Revisions:	

Mark	Date

AHJ SEAL

Project Number
21049.05

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E-101

LIGHT FIXTURE SCHEDULE

TYPE	SYMBOL	MANUFACTURER	MODEL NUMBER	VOLTS	QUA.–LAMP	MOUNTING	WATTS	REMARKS
A2	▭	LUMINAIRE	VPF8–2–LED–50W–40K–120–OP–COLOR	120	5,200 LUMEN LED, 4000K	SURFACE	55	8"x24" HIGH PERFORMANCE LED, DAMP RATED
A4	▭	LUMINAIRE	VPF8–4–LED–50W–40K–120–OP–COLOR	120	5,200 LUMEN LED, 4000K	SURFACE	55	8"x48" HIGH PERFORMANCE LED, DAMP RATED
B	☼	LITHONIA	WDGE2–P4–P3SW–50K–MVOLT–VW–COLOR	120	4,500 LUMEN LED, 5000K	WALL	38	11.5"Wx9"H ARCHITECTURAL WALL SCONCE, WET RATED
C4	▭	LUMINAIRE	VPF8–4FT–50W–50K–MVOLT–OP–COLOR	120	5,900 LUMEN LED, 5000K	SURFACE	56	8"x48" HIGH PERFORMANCE LED, DAMP RATED
EM	◁▭	LITHONIA	ELM2L–M12	120	(2) 2.4W LED	SURFACE	5	EMERGENCY LIGHTING UNIT (2) LAMPS WITH 90 MIN. EMERGENCY OPERATION

NOTE: E.C. TO PROVIDE LAMPS FOR ALL FIXTURES. EMERGENCY LAMPS SHALL NOT OPERATE AS A NIGHT LIGHT UNLESS SO NOTED ON PLANS. EMERGENCY BATTERY PACK SHALL BE WIRED WITH AN UNSWITCHED HOT LEG.

PANELBOARD: A

VOLTS (L-L) 240 | VOLTS (L-N) 120 | PHASE 1 | WIRE 3 | MLO | MCB 200 | SOURCE UTILITY
MOUNTING SURFACE | TYPE NEMA 1 | FEED THRU LUGS (Y/N) NO | SERIES RATED (Y/N) NO | SHUNT TRIP MAIN (Y/N) NO | MINIMUM AIC RATING 10000 | SOURCE FEEDER AMPS 200
BUS MATERIAL COPPER | TOP OR BOTTOM FEED? BOTTOM | GROUND BUS YES | BRANCH BKRS BOLT-ON | S. E. RATED (Y/N) YES | NEUTRAL RATING (%) 100 | LOCATION RESTROOM BUILDING

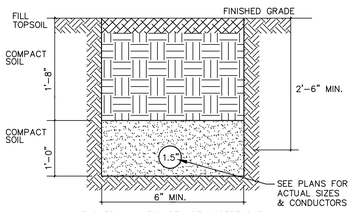
CODE	CKT. #	CIRCUIT BREAKER AMP	CIRCUIT BREAKER POLES	WIRE & CONDUIT	LOAD SERVED	KVA	PHASE LOADS LEFT	PHASE LOADS RIGHT	KVA	LOAD SERVED	WIRE & CONDUIT	CIRCUIT BREAKER POLES	CIRCUIT BREAKER AMP	CKT. #	CODE
1	1	20	1	#12, 3/4"	BUILDING LIGHTS	0.6	0.6		0.0	SPARE		1	20	2	1
1	3	20	1	#12, 3/4"	RESTROOM LIGHTS	1.0		1.0	0.0	SPARE		1	20	4	1
2	5	20	1	#12, 3/4"	EXT. W/PIGTI	0.2	0.2		0.0	SPARE		1	20	6	1
2	7	20	1	#12, 3/4"	RESTROOM RECEPTS	0.2		0.2	0.0	SPARE		1	20	8	1
2	9	20	1	#12, 3/4"	RESTROOM RECEPTS	0.2	0.2		0.0	SPARE		1	20	10	1
2	11	20	1	#12, 3/4"	EXHAUST FAN	0.5		0.5	0.0	SPARE		1	20	12	1
6	13	20	2	#12, 3/4"	RESTROOM HEATER	2.0	2.0		0.0	SPARE		1	20	14	1
6	15					2.0		2.0	0.0	SPARE		1	20	16	1
6	17	20	2	#12, 3/4"	RESTROOM HEATER	2.0	2.0		0.0	SPARE		1	20	18	1
6	19					2.0		2.0	0.0	SPARE		1	20	20	1
6	21	20	2	#12, 3/4"	CHASE HEATER	2.0	2.0		0.0	SPARE		1	20	22	1
6	23					2.0		2.0	0.0	SPARE		1	20	24	1
4	25	50	2	#6,1"	INSTANT WATER HEATER	4.8	4.8		0.0	SPARE		1	20	26	2
4	27					4.8		4.8	0.0	SPARE		1	20	28	1
4	29	20	1	#12, 3/4"	HAND DRYER	1.5	1.5		0.0	SPARE		1	20	30	1
4	31	20	1	#12, 3/4"	HAND DRYER	1.5		1.5	0.0	BLANK		1	20	32	1
2	33	20	1	#12, 3/4"	EXT. W/PIGTI	0.4	0.4		0.0	BLANK		1	20	34	1
2	35	50	2		SPARE	0.0		0.0	0.0	BLANK		1	20	36	2
2	37					0.0	0.0		0.0	BLANK		1	20	38	2
2	39	20	1		BLANK	0.0		0.0	0.0	BLANK		1	20	40	2
2	41	20	1		BLANK	0.0	0.0		0.0	BLANK		1	20	42	2

	AMPS
PANEL RATING @ 80%	160
61% SPARE CAPACITY	97.1

	LEFT	RIGHT
CONNECTED KVA	13.7	14.0
CONNECTED AMPS	57.1	58.3

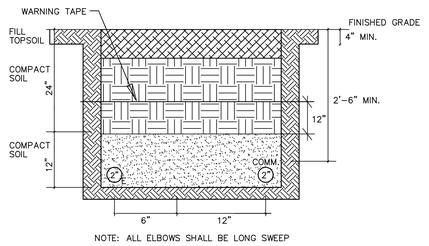
CODE	CONN. LOAD BREAKDOWN	KVA	DEMAND FACTOR	DEMAND KVA	
1	LIGHTING	1.6	100%	1.6	
2	RECEPTACLES	1.5	100/50%	1.5	
3	EQUIPMENT	0.0	40%	0.0	
4	HEATING	12.6	0%	0.0	
5	COOLING	0.0	80%	0.0	
6	MISC. MECHANICAL	12.0	100%	12.0	
7	MISCELLANEOUS	0.0	100%	0.0	
8		0.0	100%	0.0	
9		0.0	100%	0.0	
10	SUBFED SECTIONS	0.0	100%	0.0	
11			100%	0.0	
	CONNECTED KVA	27.7		15.1	=DEMAND KVA
				62.9	=DEMAND AMPS

GENERAL NOTES:
-PANEL LOAD SHOULD BE BALANCED WITHIN 10%
(*) INDICATES HACR BREAKER FOR HVAC EQUIP.
(**) INDICATES SHUNT TRIP BREAKER



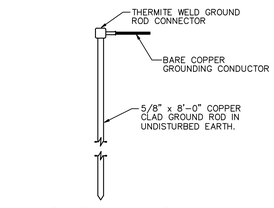
PLOWED IN LINES ARE NOT ACCEPTABLE.

POLE LIGHTING TRENCH INSTALLATION DETAIL
1 N.T.S.

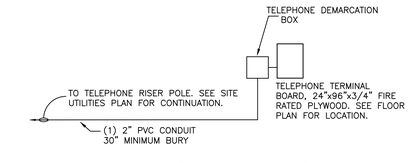


NOTE: ALL ELBOWS SHALL BE LONG SWEEP

ELECTRIC/COMM TRENCH/BACKFILL DETAIL
2 N.T.S.



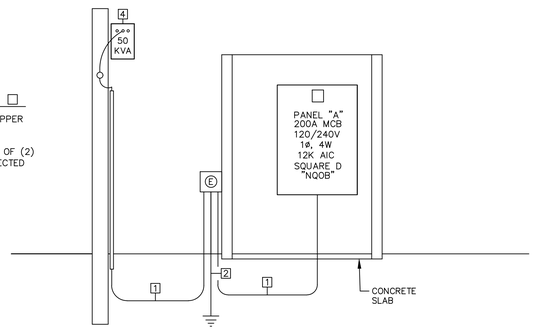
GROUND ROD DETAIL
3 N.T.S.



TELEPHONE & COMM. RISER DETAIL
4 N.T.S.

POWER RISER NOTES:

1. (1) SET OF 3 #3/0 THHN & 1 #6 COPPER GROUND IN 2"C.
2. PROVIDE GROUNDING MAT CONSISTING OF (2) 5/8"x8' DRIVEN GROUND RODS CONNECTED BY 1# 4 GROUNDING CONDUCTOR.



POWER RISER DIAGRAM
5 N.T.S.

UNDERGROUND CONDUITS REQUIREMENTS

1. GENERAL:

A. EXCAVATION, CONDUIT AND BACKFILL BY CONTRACTOR.

B. POLE MOUNT TRANSFORMERS, JUNCTION ENCLOSURES, HIGH VOLTAGE POWER CONDUCTORS AND INSTALLATION OF SAME BY LOCAL POWER COMPANY.

C. UNDERGROUND CONSTRUCTION BY CONTRACTOR IS SUBJECT TO INSPECTION BY LOCAL POWER COMPANY, AND MUST BE APPROVED BY LOCAL POWER COMPANY PRIOR TO THE INSTALLATION OF CONDUCTOR AND TRANSFORMERS. CONDUIT TO BE INSPECTED BEFORE BACKFILLING.

D. REFER TO LOCAL POWER COMPANY'S OPERATING POLICIES FOR ADDITIONAL RULES AND REGULATIONS.

E. AREA IN QUESTION WILL BE AT LEAST ROUGH GRADE BEFORE ANY TRENCHING CAN BEGIN.

F. ANY CHANGES TO THESE OR ANY OTHER LOCAL POWER COMPANY SPECIFICATIONS RELATING TO SAME MUST BE DESIGNED OR APPROVED BY LOCAL POWER COMPANY.

G. BEFORE ANY EXCAVATION IS PERFORMED NEAR LOCAL POWER COMPANY'S EXISTING FACILITIES, A 48-HOUR NOTICE TO BUD (1-800-752-6007) MUST BE GIVEN SO THAT NECESSARY ACTION CAN BE TAKEN TO MINIMIZE DANGER TO LIFE AND/OR PROPERTY.

2. CONDUIT REQUIREMENTS:

A. MINIMUM SIZE OF CONDUIT FOR UNDERGROUND PRIMARY TO BE (2) 4" SCH 40 PVC AND MINIMUM DEPTH FOR THIS CONDUIT TO BE 42". MINIMUM SIZE OF SECONDARY CONDUIT TO BE 2" SCH 40 PVC AND MINIMUM DEPTH 30".

B. ALL CONDUITS TO BE TURNED UP ONTO TRANSFORMER POLE AS SHOWN. SEE ATTACHED DETAILS.

C. ALL BENDS IN CONDUIT TO BE OF SUFFICIENT RADII TO PERMIT EASE IN PULLING WIRE (NO PLUMBERS BENDS WILL BE ACCEPTED). ALL 90° BENDS IN PRIMARY CONDUIT WILL HAVE A MINIMUM RADIUS OF 36". ALL 90° BENDS IN SECONDARY CONDUIT WILL HAVE A MINIMUM RADIUS OF 18".

D. ALL CONDUITS TO CONTAIN 150 LB. TEST (OR GREATER) NYLON STRING.

E. BACKFILL OVER CONDUIT TO CONTAIN NO LARGE ROCKS OR DEBRIS.

F. ALL CONDUITS BENEATH ROAD SURFACE WILL BE SCH 80, OR ENCASED IN A 4" CONCRETE ENVELOPE, AND WILL BE BACKFILLED WITH NO 9 CRUSHED STONE.

G. ALL CONDUITS WILL BE INSTALLED AS SPECIFIED AND LOCATED BENEATH ALL OTHER UTILITIES WHERE POSSIBLE. ALTERATIONS TO THIS SPECIFICATION WILL BE DESIGNED OR APPROVED BY LOCAL POWER COMPANY.

H. A "BURIED ELECTRIC LINES" WARNING TAPE (3" MINIMUM WIDTH) WILL BE INSTALLED 12" DIRECTLY OVER PRIMARY CONDUITS AND 12" BENEATH FINAL GRADE FOR SAME.

I. SECONDARY CONDUITS WILL ALSO REQUIRE WARNING TAPE TO BE INSTALLED 12" BENEATH FINAL GRADE.

J. WARNING TAPE WILL BE BY CONTRACTOR.

K. CONTRACTOR MUST PROVIDE 30' RUNS OF 4" CONDUIT AND REQUIRED HARDWARE AT THE RISER POLE. LOCAL UTILITY COMPANY WILL PROVIDE STAND-OFF BRACKETS. SEE POWER RISER DIAGRAM FOR QUANTITIES.

L. REAR PORTION OF TRANSFORMER PAD MUST REST ON UNDISTURBED OR WELL COMPACTED SUBGRADE.

M. ENTIRE EXCAVATED AREA NEAR PAD TO BE BACKFILLED WITH NO 9 CRUSHED STONE.

N. WHEN INSTALLING POWER CONDUCTORS PARALLEL TO WATER, SEWER, CABLE TELEVISION, GAS, TELEPHONE LINES, AND ETC, THERE MUST BE A MINIMUM OF 3' SEPARATION. NO OTHER UTILITIES MAY BE DIRECTLY ABOVE THE POWER CABLES.

O. WHEN CROSSING OVER OTHER UTILITIES' BURIED LINES, INSTALL 4" CONCRETE ENCASEMENT AROUND CONDUIT TO LENGTH OF 4' TO EACH SIDE OF BURIED LINE BEING CROSSED. WHEN CROSSING UNDER OTHER UTILITIES' BURIED LINES, THERE MUST BE A MINIMUM OF A 2' SEPERATION.

P. COORDINATE INSTALLATIONS OF METERING AND POWER AND OTHER REQUIREMENTS FOR METERING AND DISCONNECTS WITH LOCAL POWER COMPANY.

UG CONDUIT NOTES
6 N.T.S.

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COMMONWEALTH OF KENTUCKY WILLIAM GREGORY WILSON 17178 LICENSED PROFESSIONAL ENGINEER

Electrical Schedules & Details

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