



PROJECT MANUAL

VOLUME #2 of 3

PAYNEVILLE ELEMENTARY SCHOOL RENOVATION AND ADDITION Payneville, Kentucky

OWNER

Meade County Board of Education
Brandenburg, Kentucky

SUPERINTENDENT – Dr. John Millay

SCB 1569/ BG #18-283

July 10, 2019

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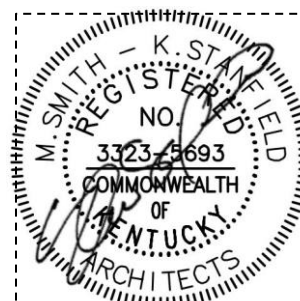


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Payneville Elementary School
Renovation/ Addition
SCB Project No. 1569

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

Facility Construction Subgroup

DIVISION 02 - DEMOLITION

- 023200 - Geotechnical Investigation and Report
- 024100 - Demolition
- 024119 - Selective Building Demolition

DIVISION 03 - CONCRETE

- 033000 - Cast-In-Place Concrete

DIVISION 04 - MASONRY

- 040100 - Masonry Cleaning
- 042000 - Unit Masonry

DIVISION 05 - METALS

- 051200 - Structural Steel Framing
- 051213 - Architecturally Exposed Structural Steel Framing
- 052100 - Steel Joist Framing
- 053100 - Steel Decking
- 055000 - Metal Fabrications
- 055213 - Pipe and Tube Railings

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

- 061053 - Miscellaneous Rough Carpentry
- 061600 - Sheathing
- 064100 - Architectural Wood Casework
- 066100 - Glass Fiber Reinforced Resin Units

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

- 070150.19 - Preparation for Re-Roofing
- 071113 - Bituminous Dampproofing
- 071900 - Water Repellents
- 072100 - Thermal Insulation
- 072119 - Foamed-In-Place Insulation

- 072500 - Weather Barriers
- 074113.16 - Standing Seam Metal Roof Panels
- 074213.19 - Preformed Metal Modular Panel Wall System
- 075700 - Coated Foamed Roofing
- 076200 - Sheet Metal Flashing and Trim
- 077200 - Roof Accessories
- 078100 - Applied Fireproofing
- 078413 - Penetration Firestopping
- 078446 - Fire-Resistive Joint Systems
- 079200 - Joint Sealants
- 079219 - Acoustical Joint Sealants

DIVISION 08 - OPENINGS

- 081113 - Hollow Metal Doors and Frames
- 081416 - Flush Wood Doors
- 084113 - Aluminum-Framed Entrances and Storefronts
- 087100 - Door Hardware
- 088000 - Glazing

DIVISION 09 - FINISHES

- 092100 - Spray-On Acoustical Treatment
- 092216 - Non-Structural Metal Framing
- 092900 - Gypsum Board
- 093000 - Tiling
- 095113 - Acoustical Panel Ceilings
- 095423 - Linear Metal Ceilings
- 096466 - Wood Flooring
- 096513 - Resilient Base and Accessories
- 096519 - Resilient Tile Flooring
- 096813 - Tile Carpeting
- 097200 - Vinyl Coated Fabric Wallcovering
- 099113 - Exterior Painting
- 099123 - Interior Painting

DIVISION 10 - SPECIALTIES

- 101100 Visual Display Units
- 101416 - Plaques
- 101419 - Dimensional Letter Signage
- 101423 - Panel Signage
- 102600 - Wall and Door Protection
- 102800 - Toilet, Bath, and Laundry Accessories
- 104413 - Fire Protection Cabinets
- 104416 - Fire Extinguishers
- 105300 - Aluminum Protective Canopies
- 107500 - Flagpole

- DIVISION 11 - EQUIPMENT**
116623 - Gymnasium Equipment
116653 - Gymnasium Dividers

- DIVISION 12 - FURNISHINGS**

123216 - Manufactured Plastic-Laminate-Faced Casework
126600 - Telescoping Stands

DIVISIONS 20 THROUGH 28

REFER TO VOLUME 3

- DIVISION 31 EARTHWORK**
310000 EARTHWORK
311000 SITE CLEARING
312319 DEWATERING
313116 TERMITE CONTROL

- DIVISION 32 SITE IMPROVEMENTS**
321123 AGGREGATE BASE COURSES
321216 ASPHALT PAVING
321313 CEMENT CONCRETE PAVEMENT
321373 CONCRETE PAVEMENT JOINT SEALANTS
321713 CONCRETE WHEEL STOPS
321723 PAINTED PAVEMENT MARKINGS
323113 CHAIN LINK FENCES AND GATES
329200 LAWNS AND GRASSES
329300 LANDSCAPE PLANTINGS

- DIVISION 33 UTILITIES**
330513 MANHOLES AND STRUCTURES
334111 SITE STORM UTILITY PIPING DRAINAGE
334600 SUBDRAINAGE
334900 STORM DRAINAGE STRUCTURES

- DIVISION 46 WASTE MANAGEMENT**
461313 UNDERGROUND PIPING
461343 PUMP STATION
461353 MANHOLES

SECTION 023200 - GEOTECHNICAL INVESTIGATION AND REPORT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Geotechnical investigation and report:

1. The geotechnical investigation in regards to sub-surface conditions is included for information only.
2. The geotechnical recommendations in the report are a part of the contract documents, unless specifically noted otherwise.
3. There are multiple photos of the existing asphalt pavement conditions which are available upon request.

B. Use of data:

1. This subsurface investigation was obtained only for the Architect/ Engineer use in design and is not a part of the Contract Documents.
2. The Architect/Engineer/Owner takes no responsibility for the conclusions that individual contractors may reach upon review
3. The subsurface investigation is available for bidders' information, but is not a warranty of subsurface conditions.
4. Bidders should visit the site and acquaint themselves with existing conditions.
5. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions.

1.2 QUALITY ASSURANCE

- A. A geotechnical engineer will be retained by the Owner to observe performance of work in connection with excavating, trenching, filling, backfilling, and grading, and to perform compaction tests.
- B. The Subcontractor shall readjust work performed that does not meet technical or design requirements, but make no deviation from the Contract Documents without specific and written approval from the Architect/Engineer.

END OF SECTION 023200

SECTION 024100 - DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Building demolition excluding removal of hazardous materials and toxic substances.
- B. Selective demolition of built site elements.
- C. Selective demolition of building elements for alterations purposes.
- D. Abandonment and removal of existing utilities and utility structures.
- E. Use precautionary measures to prevent subgrade issues and to avoid creating unsuitable soils as a result of construction activity.

1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 011000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.
- C. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- D. Section 016000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- E. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

1.03 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 EXECUTION

2.01 SCOPE

- A. Remove paving and curbs as required to accomplish new work.
- B. Remove all other paving and curbs within site boundaries.
- C. Within area of new construction, remove foundation walls and footings to a minimum of 2 feet below finished grade.
- D. Outside area of new construction, remove foundation walls and footings to a minimum of 2 feet below finished grade.
- E. Remove concrete slabs on grade within site boundaries.
- F. Break up concrete slabs on grade within site boundaries to permit natural moisture drainage; leave pieces not larger than 1 square yard.
- G. Remove underground tanks.
- H. Remove underground tanks that contain or once contained petroleum products; fill and bury other types of tanks.
- I. Remove manholes and manhole covers, curb inlets and catch basins.
- J. Remove fences and gates.

- K. Remove other items indicated, for salvage, relocation, and recycling.
- L. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.
- M. Contractor shall prepare and submit to the Owner a sequencing plan for demolition.
- N. Remove portions of existing building per sequence plan prepared by the Contractor.
- O. All demolition debris shall be hauled off-site and properly disposed of.

2.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 3. Provide, erect, and maintain temporary barriers and security devices.
 - 4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 6. Do not close or obstruct roadways or sidewalks without permit.
 - 7. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 - 8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Protect existing structures and other elements that are not to be removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- D. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.
- E. Underground Storage Tanks: Remove and dispose of as specified in Section 026500.

2.03 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

2.04 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as shown.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions.
- B. Separate areas in which demolition is being conducted from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 in locations indicated on drawings.
- C. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.
- D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
 - 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - 3. Verify that abandoned services serve only abandoned facilities before removal.
 - 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- E. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch as specified for patching new work.

2.05 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 024119 - SELECTIVE BUILDING DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.

- B. Related Requirements:

1. Section 011000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.
3. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- C. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and, for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's and other tenants' on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of elevator and stairs.
 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

1.7 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 1. Hazardous materials will be removed by Owner before start of the Work.
 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and preconstruction videotapes.
 - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
 - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
 - 1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Equipment to Be Removed: Disconnect and cap services and remove equipment.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."
- B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 033000 - 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 building cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Interior Slabs-on-grade.
 - 4. Building Walls - Concrete Fill for Insulated Concrete Forms.
- B. Related Sections include the following:
 - 1. Division 3 Section "Architectural Concrete" for general building applications of specially finished formed concrete.
 - 2. Division 3 Section "Permanent Forms – Insulated Concrete Forms" for ICF construction.
 - 3. Division 2 Section "Earth Moving" for drainage fill under slabs-on-grade.

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. Use "Concrete Mix Design Submittal Form" (or similar form) at the end of this specification section to submit Concrete Mix Designs.
- C. Steel Reinforcement Shop Drawings: Shop and placement 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. Where dowels are required out of the foundation to match vertical bars in masonry (CMU) walls, pilasters, columns and/or piers, the Detailer shall show those dowels on the placement plan.

1. Shop and placement drawings for all reinforcing steel and related accessories shall be submitted to the architect/engineer for review. Prior to submitting drawings for review, the Contractor shall thoroughly check all drawings for completeness and accuracy. Any additional cost that may arise due to errors on the shop and placement drawings is the sole responsibility of the Contractor.
- D. Submit the Detailer's resume to the Engineer for review prior to the preparation of shop and placement drawings.
- E. Welding certificates.
- F. Qualification Data: For Installer, reinforcing steel fabrication shop, and testing agency.
 1. Use "Concrete Installer Qualifications Form" (or similar form) at the end of this specification section to submit qualifications of the Concrete Installer.
- G. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 1. Coarse and Fine Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- H. Material Certificates: For each of the following, signed by manufacturers, certifying compliance with requirements:
 1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.
 4. Steel reinforcement and accessories.
 5. Fiber reinforcement.
 6. Waterstops.
 7. Curing compounds.
 8. Floor and slab treatments.
 9. Bonding agents.
 10. Adhesives.
 11. Vapor retarders.
 12. Semirigid joint filler.
 13. Joint-filler strips.
 14. Repair materials.
- I. Field quality-control test and inspection reports.
- J. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An installer with a minimum of five (5) years of documented experience completing concrete work similar in materials, design and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: 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. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. 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.
- E. Steel Reinforcement Steel (rebar) Shop and Placement Drawing Detailer: A qualified Detailer who has a minimum of five (5) years of experience detailing steel reinforcement shop and placement drawings who is located within two-hundred and fifty (250) miles of the project site.
- F. Formwork: The design, construction and safety of all formwork shall conform to the requirements of ACI 347, "Guide to Formwork for Concrete" and shall be the sole responsibility of the Contractor. The Contractor shall be responsible for determining when formwork, temporary supports, shoring and other bracing may be safely removed.
- G. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-- Reinforcing Steel."
- H. ACI Publications: Comply with the requirements set forth in the following unless more stringent provisions are indicated in the Contract Documents.
1. ACI 301, "Specification for Structural Concrete"
 2. ACI 117, "Specifications for Tolerance for Concrete Construction and Materials"
 3. ACI 121, "Quality Management System for Concrete Construction"
 4. ACI 304, "Guide for Measuring, Mixing, Transporting and Placing Concrete"
 5. ACI 305, "Hot Weather Concreting": applies when climatic conditions meet the definition of "hot weather" contained within ACI 305.
 6. ACI 306.1, "Standard Specification for Cold Weather Concreting": applies when climatic conditions meet the definition of "cold weather" contained within ACI 306.1.
 7. ACI 308, "Standard Practice for Concrete Curing"
 8. ACI 309, "Guide for Consolidation of Concrete"
 9. ACI 347, "Guide to Formwork for Concrete"
 10. ACI SP 66, "ACI Detailing Manual"
 11. The Contractor shall maintain a copy of ACI Publication SP-15, "Field Reference Manual" at the job site at all times.
- I. CRSI Publications: Comply with the requirements set forth in the following unless more stringent provisions are indicated in the Contract Documents.
1. CRSI – "Manual of Standard Practice"
- J. Concrete Testing and Inspection Service: Engage a qualified independent testing and inspection agency to perform material evaluation tests, to review concrete mix designs for compliance with

the Contract Documents; perform Special Inspections in accordance with the Kentucky Building Code and the Contract Documents.

- K. Mockups: Cast concrete slab-on-grade panels to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.
 - 1. Build panel approximately 200 sq. ft. (18.6 sq. m) for slab-on-grade in the location indicated by Architect.
 - 2. Approved panels may become part of the completed Work if undisturbed at time of Substantial Completion.
- L. 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, welded wire reinforcement for floor slabs, steel reinforcement installation, 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.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 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. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- F. 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.
- G. 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.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed, for use where reinforcing steel is indicated to be welded.
- C. Plain-Steel Wire: ASTM A 82, as drawn.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets. Welded wire reinforcement rolls are not acceptable.

2.3 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.

2.4 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.
 - a. Fly Ash: ASTM C 618, class C or F.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3M 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. Coarse Aggregates: Crushed Limestone, size as specified for individual mix designs.
 2. Fine Aggregates: Clean River Sand free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.5 CHEMICAL ADMIXTURES

- A. General: Provide Chemical 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.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
- D. Retarding Admixture: ASTM C 494/C 494M, Type B.
- E. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
- F. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
- G. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
- H. Water-Reducing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 FIBER REINFORCEMENT

- A. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.
 1. Products:
 - a. Fibrillated Fibers:
 - 1) Euclid Chemical Company (The); Fiberstrand F.

- 2) Grace Construction Products, W. R. Grace & Co.; Grace Fibers.
- 3) SI Concrete Systems; Fibermesh.

2.7 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Manufacturers:

- a. Bometals, Inc.
- b. Greenstreak.
- c. Meadows, W. R., Inc.
- d. Murphy, Paul Plastics Co.
- e. Progress Unlimited, Inc.
- f. Tamms Industries, Inc.
- g. Vinylex Corp.

2. Profile: Flat, dumbbell with center bulb.

3. Dimensions: 6 inches by 3/8 inch thick.

- B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).

1. Products:

- a. Colloid Environmental Technologies Company; Volclay Waterstop-RX.
- b. Concrete Sealants Inc.; Conseal CS-231.
- c. Greenstreak; Swellstop.
- d. Henry Company, Sealants Division; Hydro-Flex.
- e. JP Specialties, Inc.; Earthshield Type 20.
- f. Progress Unlimited, Inc.; Superstop.
- g. TCMiraDRI; Mirastop.

2.8 VAPOR BARRIERS

- A. Plastic Vapor Barrier: ASTM E 1745 Class A, 20-mil minimum thickness, stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited. Include manufacturer's recommended adhesive or pressure-sensitive tape, and pipe boots.

1. Products:

- a. Fortifiber Corporation; Moistop Ultra
- b. Raven Industries Inc.; Vapor Block
- c. Stego Industries, LLC; Stego Wrap
- d. W.R. Meadows; Sealtight "Perminator"
- e. Strata Systems, Inc.; Strata Barrier 11
- f. Insulation Solutions, Inc.; Viper Vapor Check II

- B. 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 (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.
- C. 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 (9.5-mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Products:
 - a. Burke by Edoco; BurkeFilm.
 - b. Dayton Superior Corporation; Sure Film.
 - c. Euclid Chemical Company (The); Eucobar.
 - d. MBT Protection and Repair, Div. of ChemRex; Confilm.
 - e. Meadows, W. R., Inc.; Sealtight Evapre.
 - f. Sika Corporation, Inc.; SikaFilm.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
 - 1. Products:
 - a. Burke by Edoco; Spartan Cote WB II.
 - b. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Cure and Seal WB.
 - c. Dayton Superior Corporation; Safe Cure and Seal (J-18).
 - d. Euclid Chemical Company (The); Aqua Cure VOX.
 - e. Meadows, W. R., Inc.; Vocomp-20.
 - f. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.

2.10 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, 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.
- D. Reglets: Fabricate reglets of not less than 0.0217-inch- (0.55-mm-) thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- E. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) 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 (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.12 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: Flyash shall account for a maximum of 25 percent of the total cementitious material
 2. Combined Fly Ash and Pozzolan: 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing or high-range 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.
 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.

2.13 CONCRETE MIXTURES FOR STRUCTURAL ELEMENTS

- A. Foundations (Walls, Piers and Footings): Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength, f'_c : 4,000 psi at 28-days.
 2. Maximum Water-Cement Ratio: 0.50
 3. Maximum Coarse Aggregate Size: 1 inch
 4. Maximum Slump: 5.5.
 5. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: Up to (and including) 8 inches for concrete with a verified slump of 2 to 4 inches before adding high-range water-reducing admixture.
 6. Air Content: 6 percent \pm 1.5 percent.
- B. Interior Concrete Slabs – Slabs on Grade and Slabs on Metal Form Deck: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength, f'_c : 4,500 psi at 28-days.
 2. Maximum Water-Cement Ratio: 0.45
 3. Minimum Cementitious Material Content: 520 lb./ cu. yd.
 4. Maximum Coarse Aggregate Size: 0.75 inch
 5. Maximum Slump: 5.5 inches.
 6. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: Up to (and including) 8 inches for concrete with a verified slump of 2 to 4 inches before adding high-range water-reducing admixture.
 7. Air Content: 6 percent \pm 1.5 percent.
 - a. When the expected low temperature for the forty-eight (48) hour period immediately following concrete placement is above forty (40) degrees Fahrenheit, the air-entraining agent may be omitted from concrete for trowel-finished slabs on grade and suspended structural slabs. Do not allow entrapped air content to exceed three (3) percent.
 8. Synthetic Fiber: Uniformly disperse in concrete mixture at a rate of 1.5 lb./cu. yd. per manufacturer's recommendations. Use only as a replacement for specified Welded Wire Reinforcement for concrete floor slabs on grade with the written approval of the Architect/Engineer. Fiber may not be used for HCP Topping Slab reinforcement.
- C. Structural Concrete – Elevated Structural Slabs: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength, f'_c : 5,000 psi at 28-days.
 2. Maximum Water-Cement Ratio: 0.45
 3. Minimum Cementitious Material Content: 520 lb. / cu. yd.
 4. Maximum Coarse Aggregate Size: 1 inch (U.N.O.)
 5. Maximum Aggregate Size – Topping Slab: 0.5 inch
 6. Maximum Slump: 5.5 inches.
 7. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: Up to (and including) 8 inches for concrete with a verified slump of 2 to 4 inches before adding high-range water-reducing admixture.
 8. Air Content: 6 percent \pm 1.5 percent.
 - a. There is no air content requirement for interior Structural Concrete

2.14 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
 - 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.

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.
- 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 exterior 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." Setting templates are required for all anchor rod groups of two or more.
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, 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 (10 deg C) for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- 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. Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
- B. Granular Course: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- C. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- D. 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.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. 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 + 2". 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 (38 mm) 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. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. 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 (Tooled) Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). 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- (3.2-mm-) 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 (13 mm) 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 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.8 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 the Project site, or during placement without the approval of the Architect/Engineer. If water is to be added, concrete tickets must indicate water under-run. Maximum quantity of water that may be added at the Project site shall be specified on the concrete mix designs.
- C. Water added at the Project site in accordance with the limitation set forth herein shall be added before testing and sampling of the fresh concrete.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to the concrete mix.
- D. 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 (150 mm) 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.

- E. 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.
- F. 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 (4.4 deg C) 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.
- G. Hot-Weather Placement: Comply with ACI 305 and as follows:
 - 1. 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 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.

3.9 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, or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, or paint.

- 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.
- 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.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in 1 direction.
 - 1. Apply scratch finish to surfaces indicated, and to receive concrete floor toppings or mortar setting beds for bonded cementitious floor finishes.
- C. 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 restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated to receive trowel finish.
- D. 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 indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and 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.
- F. 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.

3.11 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.

3.12 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 305 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 (300-mm) 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 (300 mm), 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.

3.13 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 (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 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 (1.18-mm) 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 (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) 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 (0.25 mm) 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 (6 mm) 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 (25 mm) 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 (19-mm) 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 (25 mm) 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.

3.15 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. Provide free access to Work and cooperate with the Testing and Inspection firm as necessary to insure that all required tests and inspections are completed.
 - 1. Inspection and Testing shall be in accordance with ACI 301 except as modified herein.
 - 2. Provide a minimum of 24-hours to the Testing and Inspection firm when concrete work is scheduled.
 - 3. Provide a copy of the proposed mix design for each class of concrete to the Testing and Inspection firm for review prior to the start of concrete work.
- C. 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.
- D. 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. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - 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, pressure method, for normal-weight concrete; 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 (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M
 - a. Cast and field cure one set of four standard cylinder specimens for each composite sample.
 - b. The Contractor is required to provide a curing box on site in a secure location. Specimens shall remain in the curing box for a minimum of three days. Temperature in curing box shall be maintained above 40 degrees Fahrenheit and below 85 degrees Fahrenheit.
 - c. One additional standard cylinder specimen shall be taken for each day of concreting during cold weather. This additional specimen shall be cured under the same conditions as the concrete it represents.

6. Compressive-Strength Tests: ASTM C 39/ C 39M.
 - a. Test one field-cured specimen at 7 days and two specimens at 28 days. (Keep one specimen as a reserve for additional testing, if required by the Architect/Engineer.)
7. 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 (3.4 MPa).
8. 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.
9. 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.
10. 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.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

END OF SECTION 03300

Concrete Mix Design Submittal Form

Project Information:

Project Name: 1569 – Payneville Elementary School Renovation and Addition

Project Location: Meade County; Payneville, Kentucky

Submittal Date: _____

General Contractor: _____

Project Superintendent: _____

Job Site Telephone Number: _____

Concrete Supplier: _____

Technical Contact: _____

E-mail Address: _____

Telephone Number: _____

Batch Plant Location: _____
(City, State)

Travel Distance: _____
(Batch Plant to Project Site)

Concrete Mix Information:

Concrete Mix Design Designation: _____
(As indicated on Concrete Batch Ticket)

Concrete Use: _____
(As indicated in the Project Specifications)

Minimum Concrete Compressive Strength, f'_c : _____ psi @ _____ days

Normal-Weight Concrete: _____

Light-Weight Concrete: _____ Specified Concrete Weight: _____ pcf

Required Air Content: _____ %

Concrete Placement Method: (Specify One placement method for each Mix Design)

Bucket _____, Pump _____, Chute _____, Tremie _____,

Other _____ Specify _____

Concrete Mix Design Submittal Form

Method of Mix Design Preparation:

Field Experience Method: _____ (Submit supporting Statistical Analysis)

Trial Mixture Method: _____ (Submit supporting Test Data)

The Concrete Mix Design Proportioning Method shall be selected and executed in accordance with ACI 318-02.

Portland Cement:

Manufacturer: _____

ASTM No. _____, Type: _____

Low-Alkali: ____ Yes ____ No

Submit Material Certificates signed by manufacturer certifying that the Portland Cement proposed for use in this mix complies with the specification requirements.

Fly Ash: USE FLY ASH ONLY WHEN APPROVED BY THE ENGINEER.

Manufacturer: _____

ASTM No. _____, Type: _____

Submit Material Certificates signed by manufacturer certifying that the Fly Ash proposed for use in this mix complies with the specification requirements.

Aggregates - General:

Combined Aggregate Gradation: Aggregates shall be well graded from coarsest to finest with not more than 18-percent and not less than 8-percent retained on an individual sieve, except that less than 8-percent may be retained on the coarsest sieve, and less than 8-percent may be retained on No. 50 sieve (and on sieves finer than No. 50). Submit supporting sieve analysis to verify that Combined Aggregate Gradation meets this requirement.

Coarse Aggregate:

Supplier: _____

Type: _____ Maximum Size: _____

Oven Dry Density: _____ pcf Absorption: _____ %
(Moisture Content at SSD condition)

Submit Material Certificates signed by supplier certifying that Coarse Aggregates proposed for use in this mix comply with the requirements of ASTM C33.

Concrete Mix Design Submittal Form

Fine Aggregate:

Supplier: _____

Type: _____ Fineness Modulus: _____

Oven Dry Density: _____ pcf Absorption: _____ %
(Moisture Content at SSD condition)

Submit Material Certificates signed by supplier certifying that Fine Aggregates proposed for use in this mix comply with the requirements of ASTM C33.

Lightweight Aggregate: (When Specified)

Manufacturer: _____

Type: _____ Maximum Size: _____

Oven Dry Density: _____ pcf Absorption: _____ %
(Moisture Content at SSD condition)

Submit Material Certificates signed by manufacturer certifying that Lightweight Aggregates proposed for use in this mix comply with the requirements of ASTM C330.

CHEMICAL ADMIXTURES -

Note: Specify all types and combinations of admixtures anticipated to be used in this mix. Submit separate designs when a mix is to be modified or adjusted for weather conditions or other job site factors. Explain in Comments below.

Air Entraining Agent: (AEA)

Manufacturer: _____

Product Name: _____ ASTM No. _____

Water Reducer - Plain: (WR - Plain)

Manufacturer: _____

Product Name: _____ ASTM No. _____

Water Reducer with Set Accelerator: (WR w/ Acc.)

Manufacturer: _____

Product Name: _____ ASTM No. _____

Concrete Mix Design Submittal Form

Water Reducer with Set Retarder: (WR w/ Ret.)

Manufacturer: _____

Product Name: _____ ASTM No. _____

Set Accelerator:

Manufacturer: _____

Product Name: _____ ASTM No. _____

Set Retarder:

Manufacturer: _____

Product Name: _____ ASTM No. _____

High-Range Water Reducer - Plain: (HRWR -Plain)

Manufacturer: _____

Product Name: _____ ASTM No. _____

High-Range Water Reducer with Set Retarder: (HRWR -w/ Ret.)

Manufacturer: _____

Product Name: _____ ASTM No. _____

Comments Regarding Chemical Admixture Use in this Mix Design:

Concrete Mix Design Submittal Form

Mix Proportions: (Per Cubic Yard)

	Weight	Volume	
Cement -	_____ lbs.	_____ cu. ft.	
Fly Ash -	_____ lbs.	_____ cu. ft.	
Coarse Agg. -	_____ lbs.	_____ cu. ft.	
Fine Agg. -	_____ lbs.	_____ cu. ft.	
Lightweight Agg. -	_____ lbs.	_____ cu. ft.	
Water - (Including free water on aggregates)	_____ lbs.	_____ cu. ft.	
Other _____	(Specify Material and units of measure)		

Admixtures - Indicate whether Admixture is to be added at Batch Plant (BP) or Site

AEA -	_____ oz. / 100# cement	_____ BP	_____ Site
WR - Plain -	_____ oz. / 100# cement	_____ BP	_____ Site
WR w/ Acc. -	_____ oz. / 100# cement	_____ BP	_____ Site
WR w/ Ret. -	_____ oz. / 100# cement	_____ BP	_____ Site
Set Accelerator -	_____ oz. / 100# cement	_____ BP	_____ Site
Set Retarder -	_____ oz. / 100# cement	_____ BP	_____ Site
HRWR - Plain -	_____ oz. / 100# cement	_____ BP	_____ Site
HRWR w/ Ret. -	_____ oz. / 100# cement	_____ BP	_____ Site

Mix Design Characteristics:

Fly Ash Content - $(\text{Fly Ash Wt.}) / (\text{Fly Ash Wt.} + \text{Cement Wt.}) = \text{_____} \%$
(Must be equal to or less than 25%)

W/C Ratio - $(\text{Water Wt.}) / (\text{Fly Ash Wt.} + \text{Cement Wt.}) = \text{_____}$
(Water weight includes free water on aggregates)

$(\text{Fine Aggregate Wt.}) / (\text{Total Aggregate Wt.}) = \text{_____}$

Concrete Mix Design Submittal Form

Concrete Density -

Unit Weight (Wet) = _____ pcf

Unit Weight (Dry) = _____ pcf

Air Content: _____ %

Anticipated Slump -

Initial Slump = _____ in. (Before adding WR or HRWR)

Final Slump = _____ in. (After adding WR or HRWR)

Mix Design Prepared By: _____

(Typed / Printed Name)

(Signature)

Chloride Ion Content -

The Concrete Producer certifies that the total chloride ion content of this concrete mix, as tested in accordance with ASTM C1218, does not exceed the amounts specified in Table 4.4.1 of ACI 318-02.

Alkali Content -

The Concrete Producer certifies that the total alkali content contributed from cementitious materials does not exceed 4.0 lbs / cu. yd. of concrete or certifies that the aggregate contains no deleterious material that may react with alkalis in the concrete mix.

Certified By: _____

(Authorized Representative of Concrete Supplier - Typed / Printed Name)

(Signature)

Concrete Installer Qualifications Form

Project Information:

Project Name: 1569 – Payneville Elementary School Renovation and Addition

Project Location: Meade County: Payneville, Kentucky

Submittal Date: _____

General Contractor: _____

Project Superintendent: _____

Job Site Telephone Number: _____

Concrete Installer:

Company Name: _____

Company Address: _____

Contact: _____

Telephone Number: _____

Concrete Installer Qualifications :

The Concrete Installer has experience in completing concrete work on projects similar to this project in size and scope, and demonstrated by at least five (5) previous projects. List five (5) successful projects completed by the Concrete Installer. Provide Project Name, Location, and the Name and Telephone Number of the Owner's Representative for each Project.

1. _____
2. _____
3. _____
4. _____
5. _____

The Concrete Installer's Field Supervisor is certified under the ACI "Concrete Flatwork Finisher Training and Certification Program" _____ Yes _____ No

Concrete Installer Qualifications Form

(If "No", the Field Supervisor for this project must have been the Field Supervisor on each at least three (3) of the projects listed above.)

A "Responsible Officer" of the General Contractor's company shall sign this form below signifying that, to the best of the GC's knowledge, the information contained hereon is complete and accurate.

Signature of Responsible Officer

Date

Typed / Printed Name of Responsible Officer: _____

Telephone Number: _____

Email Address: _____

Business Address: _____

SECTION 040110 - MASONRY CLEANING

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. Section 042000 – Unit Masonry: Brick Masonry Units
- C. Section 042000 – Unit Masonry: Mortar and Grout
- D. Section 071900 – Water Repellants
- E. Section 099113 – Exterior Painting: Brick Stain

1.2 SUMMARY

- A. Section includes cleaning the following:
 - 1. Unit masonry surfaces.

1.3 DEFINITIONS

- A. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

1.4 PREINSTALLATION MEETINGS

1.5 SEQUENCING AND SCHEDULING

- A. Work Sequence: Perform masonry-cleaning work in the following sequence:
 - 1. Inspect for open mortar joints. Where repairs are required, delay further cleaning work until after repairs are completed, cured, and dried to prevent the intrusion of water and other cleaning materials into the wall.
 - 2. Clean masonry surfaces.
 - 3. Where water repellents are to be used on or near masonry, delay application of these chemicals until after cleaning.
- B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units according to masonry repair Sections. Patch holes in mortar joints according to masonry repointing Sections.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include material descriptions and application instructions.
2. Include test data substantiating that products comply with requirements.

1.7 QUALITY ASSURANCE

- A. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection, preconstruction product testing, and on-site assistance.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry-cleaning work to be performed according to product manufacturers' written instructions and specified requirements.
- B. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least seven days after completion of cleaning.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

- A. Water: Potable.
- B. Mold, Mildew, and Algae Remover, Job Mixed: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 5 quarts of 5 percent sodium hypochlorite (bleach), and 15 quarts of hot water for every 5 gal. of solution required.

2.2 CHEMICAL CLEANING SOLUTIONS

- A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended in writing by chemical-cleaner manufacturer.
- B. Acidic Cleaner Solution for Nonglazed Masonry: Dilute acidic cleaner with water to produce hydrofluoric acid content of 3 percent or less, but not greater than that recommended in writing by chemical-cleaner manufacturer.
 1. Stones: Use only on unpolished granite, unpolished dolomite marble, and siliceous sandstone.
- C. Acidic Cleaner for and: Dilute acidic cleaner with water to concentration demonstrated by testing that does not etch or otherwise damage glazed or polished surface, but not greater than that recommended in writing by chemical-cleaner manufacturer.
 1. Stones: Use only on polished granite and polished dolomite marble.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent paint removers and chemical cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
 - 1. Cover adjacent surfaces with materials that are proven to resist paint removers and chemical cleaners used unless products being used will not damage adjacent surfaces. Use protective materials that are waterproof and UV resistant. Apply masking agents according to manufacturer's written instructions. Do not apply liquid strippable masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
 - 2. Do not apply chemical solutions during winds of enough force to spread them to unprotected surfaces.
 - 3. Neutralize alkaline and acid wastes before disposal.
 - 4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
- B. Remove gutters and downspouts and associated hardware adjacent to immediate work area and store during masonry cleaning. Reinstall when masonry cleaning is complete.
 - 1. Provide temporary rain drainage during work to direct water away from building.

3.2 CLEANING MASONRY, GENERAL

- A. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.
- B. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.
- C. Use only those cleaning methods indicated for each masonry material and location.
 - 1. Brushes: Do not use wire brushes or brushes that are not resistant to chemical cleaner being used.
 - 2. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage surfaces, including joints.
 - a. Equip units with pressure gages.
 - b. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with nozzle having a cone-shaped spray.
 - c. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.
 - d. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.

- D. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces. Keep wall wet below area being cleaned to prevent streaking from runoff.
- E. Perform additional general cleaning, paint and stain removal, and spot cleaning of small areas that are noticeably different when viewed according to the "Cleaning Appearance Standard" Paragraph, so that cleaned surfaces blend smoothly into surrounding areas.
- F. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces according to chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.
- G. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
 - 1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.
- H. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.3 PRELIMINARY CLEANING

- A. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to planned cleaning methods. Extraneous substances include paint, calking, asphalt, and tar.
 - 1. Carefully remove heavy accumulations of rigid materials from masonry surface with sharp chisel. Do not scratch or chip masonry surface.
 - 2. Remove paint and calking with alkaline paint remover.
 - a. Comply with requirements in "Paint Removal" Article.
 - b. Repeat application up to two times if needed.
 - 3. Remove asphalt and tar with solvent-type paste paint remover.
 - a. Comply with requirements in "Paint Removal" Article.
 - b. Apply paint remover only to asphalt and tar by brush without prewetting.
 - c. Allow paint remover to remain on surface for 10 to 30 minutes.
 - d. Repeat application if needed.

3.4 CLEANING MASONRY

- A. Mold, Mildew, and Algae Removal:
 - 1. Apply mold, mildew, and algae remover by brush.
 - 2. Scrub surface with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that surface remains wet.

3. Rinse with cold water applied by medium-pressure spray to remove mold, mildew, and algae remover and soil.
4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

END OF SECTION 040110

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Face brick.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.
9. Calcium Silicate Units

B. Related Sections:

1. Section 033000 "Concrete Work" for installing dovetail slots for masonry anchors.
2. Section 047200 "Cast Stone Masonry" for furnishing cast stone trim.
3. Section 051200 "Structural Steel" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
4. Section 055000 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
5. Section 071900 "Water Repellents" for water repellents applied to unit masonry.
6. Section 072100 "Thermal Insulation" for rigid cavity insulation.
7. Section 072119 "Foamed-In-Place Insulation" for spray foam insulation at cavity locations.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Clay Masonry Unit Test: For each type of unit required, according to ASTM C 67 for compressive strength.
2. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
3. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
 1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
- C. Samples for Initial Selection:
 1. Face brick.
 2. Colored mortar.
 3. Weep holes/vents.
 4. Calcium Silicate Units, in all finishes indicated in construction documents

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Material Certificates: For each type and size of the following:
 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C 67.
 2. Cementitious materials. Include brand, type, and name of manufacturer.
 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 4. Grout mixes. Include description of type and proportions of ingredients.
 5. Reinforcing bars.
 6. Joint reinforcement.
 7. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 1. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Build mockups for typical exterior wall in sizes approximately 64 inches (1625.6 mm) long by 72 inches (1800 mm) high by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches (400 mm) long in exterior wall mockup.
 - b. Include lower corner of window opening framed with stone trim at upper corner of exterior wall mockup. Make opening approximately 12 inches (300 mm) wide by 16 inches (400 mm) high.
 - c. Include metal studs, sheathing, building wrap, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
 - d. Mockup to include calcium silicate units, cast stone water table, cast stone heads and sills and their associated flashing.
 - 3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
 - 4. Protect accepted mockups from the elements with weather-resistant membrane.
 - 5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
 - 6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide bullnose units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide Type 1, moisture controlled, units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
 - 2. Density Classification: Lightweight.
 - 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
 - a. 4 inches (100 mm) nominal; 3-5/8 inches (92 mm) actual.
 - b. 6 inches (150 mm) nominal; 5-5/8 inches (143 mm) actual.
 - c. 8 inches (200 mm) nominal; 7-5/8 inches (194 mm) actual.
 - d. 12 inches (300 mm) nominal; 11-5/8 inches (295 mm) actual.
 - 4. Shapes: Bullnose CMU shall be used at all outside corners U.N.O., refer to details for wall base conditions in contract documents.

2.3 CONCRETE and MASONRY LINTELS

- A. General: Provide one of the following:
- B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than CMUs.
- C. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Face Brick: Facing brick complying with ASTM C 216.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Field Brick: Owner to select from full range available within allowance indicated.
 - b. Brick Infill: Owner to select from full range available within allowance indicated to match existing brick.
2. Grade: SW.
3. Type: FBS.
4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi (23.10 MPa).
5. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67.
6. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
7. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet (3 m) or shall have a history of successful use in Project's area.
8. Size (Actual Dimensions): 3-5/8 inches wide by 3-5/8 inches (57 mm) high by 15-5/8 inches long.
9. Application: Use where brick is exposed unless otherwise indicated.
10. Color and Texture: As selected by Architect.

2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Essroc
 - b. Holcim (US) Inc.; Mortamix Masonry Cement.
 - c. Lafarge North America Inc.; Magnolia Masonry Cement.
 - d. Lehigh Cement Company; Lehigh Masonry Cement.
- E. Masonry Cement: ASTM C 1329.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lafarge North America Inc.; Magnolia Superbond Mortar Cement.
- F. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than ¼ inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C 404.
- H. Cold-Weather Admixture: 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.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Euclid Chemical Company (The); Accelguard 80.
 - b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
 - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
- I. Water: Potable.

2.6 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
 - 1. Interior Walls: Mill- galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 - 3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
 - 4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
 - 5. Wire Size for Veneer Ties: 0.148-inch (3.77-mm) diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
 - 7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

D. Masonry Joint Reinforcement for Multiwythe Masonry:

1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches (100 mm) wide, plus 1 side rod at each wythe of masonry 4 inches (100 mm) wide or less.
2. Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face.
3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.7 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 641/A 641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
4. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.

1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches (50 mm) long may be used for masonry constructed from solid units.
2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm).
3. Wire: Fabricate from 1/4-inch-(6.35-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls unless otherwise indicated.

D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-(6.35-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch-(6.35-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.

E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch-(2.66-mm-) thick, steel sheet, galvanized after fabrication.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch-(6.35-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.

F. Rigid Anchors: Fabricate from steel bars bent to configuration indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

G. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over ICF or over sheathing to metal studs, and as follows:
 - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).
2. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187-inch-(4.76-mm-) diameter, hot-dip galvanized-steel wire unless otherwise indicated.
3. Contractor's Option: Unless otherwise indicated, provide any of the following types of anchors:
4. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Dayton Superior Corporation, Dur-O-Wal Division
 - 2) Heckmann Building Products Inc.
 - 3) Hohmann & Barnard, Inc.
 - 4) Wire-Bond

2.8 MISCELLANEOUS ANCHORS

- A. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch (0.86-mm), galvanized steel sheet.

2.9 EMBEDDED FLASHING MATERIALS

- A. Flexible Flashing: Use the following unless otherwise indicated:

1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch (1.02 mm).
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Advanced Building Products Inc.; Peel-N-Seal.

- 2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
- 3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier Thru-Wall Flashing.
- 4) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
- 5) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
- 6) Hohmann & Barnard, Inc.; Textroflash.
- 7) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
- 8) Polyguard Products, Inc.; Polyguard 300.
- 9) Sandell Manufacturing Co., Inc.; Sando-Seal.
- 10) Williams Products, Inc.; Everlastic MF-40.

- b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

- B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep/Vent Products: Use the following unless otherwise indicated:
 1. Wicking Material: Absorbent rope, made from cotton, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity. Use only for weeps.
 2. Aluminum Weep Hole/Vent: One-piece, L-shaped units made from sheet aluminum, designed to fit into a head joint and consisting of a vertical channel with louvers stamped in web and with a top flap to keep mortar out of the head joint; painted before installation to comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" in color selected by Architect.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hohmann & Barnard, Inc.; #343W - Wilko Weep Hole.
- E. Cavity Drainage Material: Semi-rigid polyethylene mesh panels, sized to the thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage. A mortar diverter out of 8" high panels designed for installation at flashing locations.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Advanced Building Products, Inc: www.advancedflashing.com.
 - b. Mortar Net USA, Ltd: www.mortarnet.com
 - c. Masonry Reinforcing Corporation of America: www.wirebond.com
- F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
 - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
 - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
 - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.11 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned. Cleaner to be for Red and Light-Colored Brick, Not Subject to Metallic Staining with Mortar Not Subject to Bleaching.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Diedrich Technologies, Inc.
 - b. ProSoCo, Inc.

2.12 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime, masonry cement, or mortar cement mortar unless otherwise indicated.
 - 3. For exterior masonry, use portland cement-lime, masonry cement, or mortar cement mortar.
 - 4. For reinforced masonry, use portland cement-lime, masonry cement, or mortar cement mortar.
 - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type S.
3. For mortar parge coats, use Type N.
4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
5. For interior non-load-bearing partitions, Type O may be used instead of Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.

2.13 CALCIUM SILICATE MASONRY UNITS

A. Products: Basis of Design Arriscraft International "Citadel Georgia, USA" Series.

1. Texture/ Finish: 75% Color "A" with 25% Color "B".
2. Color: As selected from manufacturer's full range of color
3. Size and Type: Random 4-Unit Bond Ashlar Pattern with unit sizes 2-3/8" High, 3-5/8" High, 5-1/4" High, and 8-1/8" High with random lengths up to 23-5/8".
4. Special Shapes: Provide special shapes on exposed surfaces, such as for corner units that cannot be produced by sawing. Sawed surfaces shall not be exposed to view. Provide thickness as indicated on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
 - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
 - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
 - 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
 - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
 - 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 1. Install compressible filler in joint between top of partition and underside of structure above.
 2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 2. Allow cleaned surfaces to dry before setting.
 3. Wet joint surfaces thoroughly before applying mortar.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
 1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement.
 - c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement to allow for differential movement regardless of whether bed joints align.
 2. Header Bonding: Provide masonry unit headers extending not less than 3 inches (76 mm) into each wythe. Space headers not over 8 inches (203 mm) clear horizontally and 16 inches (406 mm) clear vertically.
 3. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Bond wythes of cavity walls together using bonding system indicated on Drawings.

- C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity.
- D. At masonry backup locations coat cavity face of backup wythe to comply with Section 071113 "Bituminous Dampproofing." Note, Dampproofing is not required at the ICF construction.
- E. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
 - 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
 - 1. Provide an open space not less than 1 inch (25 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.9 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors to concrete and masonry backup, and to ICF, with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections in masonry joints. Provide not less than 2 inches (50 mm) of air space between back of masonry veneer and face of sheathing.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches (406 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally with not less than 1 anchor for each 3.5 sq. ft. (0.33 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (914 mm), around perimeter.

3.10 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows:
 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 2. Install preformed control-joint gaskets designed to fit standard sash block.
 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Form expansion joints in brick as follows:
 1. Build flanges of factory-fabricated, expansion-joint units into masonry.
 2. Build in compressible joint fillers where indicated.
 3. Form open joint full depth of brick wythe and of width indicated, but not less than 1/2 inch (13 mm) for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."
- D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealants," but not less than 3/8 inch (10 mm).
 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.11 LINTELS

- A. Install steel lintels where indicated.
- B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
 1. Use specifically formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Cure pre-cast lintels before handling and installing. Temporarily support built-in place lintels until cured.

2. If formed in-place lintels are used, contractor to comply with the requirements in Division 3- Concrete Work.

C. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches (200 mm), and through inner wythe to extend 1/2 inch (13 mm) beyond the face of wall in exposed masonry. Once Architect and Owner review installation, contractor to trim flashing back flush with face of masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches (50 mm) on interior face.
3. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches (200 mm); with upper edge tucked under building paper or building wrap, lapping at least 4 inches (100 mm).
4. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
5. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
3. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
4. Space weep holes formed from wicking material 16 inches (400 mm) o.c.
5. Trim wicking material flush with outside face of wall after mortar has set.

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

F. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.13 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 2 special inspections according to the "International Building Code."
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

- I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.
- J. **WHERE MASONRY UNITS ARE EXPOSED TO VIEW, PROVISIONS WITHIN ASTM C 216, ASTM C 129, ASTM C 90, AND ASTM C 73 FOR FINISH AND APPEARANCE ARE SUBJECT TO ARCHITECT AND OWNER'S FINAL REVIEW AND ACCEPTANCE. SAMPLE MASONRY WALLS WILL BE FIELD SELECTED AND APPROVED AT VARIOUS STAGES OF CONSTRUCTION AND FINISHING, INCLUDING INTERIOR CMU WALLS. THE APPROVED MASONRY WALLS WILL BE SUBJECT TO COMPARISON TO THE APPROVED SAMPLE MASONRY WALLS. MASONRY WALLS NOT IN COMPLIANCE WITH THE REQUIREMENTS HEREIN ARE SUBJECT TO REMOVAL, REPLACEMENT, AND/ OR REPAIR. WHERE MASONRY WALLS ARE REJECTED, THE CONTRACTOR WILL SUBMIT REMEDIAL OPTIONS FOR REVIEW AND ACCEPTANCE TO THE OWNER AND ARCHITECT.**

3.15 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
 - 8. Clean stone trim to comply with stone supplier's written instructions.

3.16 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 042000

SECTION 05120 - STRUCTURAL STEEL 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. This Section includes the following:
 - 1. Structural steel.
 - 2. Architecturally exposed structural steel.
 - 3. Grout.
- B. Related Sections include the following:
 - 1. Division 1 Section "Quality Controls" for independent testing agency procedures and administrative requirements.
 - 2. Division 5 Section "Steel Decking" for field installation of shear connectors.
 - 3. Division 5 Section "Metal Fabrications" for steel lintels or shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other metal items not defined as structural steel.
 - 4. Division 9 painting section for surface preparation and priming requirements.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.
- B. Architecturally Exposed Structural Steel: Structural steel designated as architecturally exposed structural steel in the Contract Documents.

1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD-service loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC's "Manual of Steel Construction, Allowable Stress Design," Part 4.
 - 2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.
- B. Construction: Type 2, simple framing.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 - 5. For structural-steel connections indicated to comply with design loads, include structural analysis data by the qualified professional engineer responsible for their preparation.
- C. Welding certificates.
- D. Qualification Data: For installer, fabricator, detailer, and testing agency.
- E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
 - 1. Structural steel including chemical and physical properties.
 - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 3. Direct-tension indicators.
 - 4. Tension-control, high-strength bolt-nut-washer assemblies.
 - 5. Shear stud connectors.
 - 6. Shop primers.
 - 7. Nonshrink grout.
- F. Source quality-control test reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified steel erector specializing in performing work of this section with a minimum of five (5) years of documented experience.
- B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant or a qualified fabricator who participates in the AWS Certified Welding Fabricator Program and is an AWS-Certified Plant.
 - 1. EXCEPTION: The Owner will secure and pay for the services of the Special Inspector (as defined by the KBC) for this project. The Special Inspector shall verify that a fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards. The Special Inspector shall review the procedures for completeness and adequacy relative to the code requirements for the fabricator's scope of work. The requirement for the fabrication shop to be AISC / AWS Certified will be waived when the Special Inspections outlined herein are completed to the satisfaction of the Special Inspector and the Architect. The fabricator shall reimburse the Owner for all costs and expenses associated with the performance of all Special Inspections carried out in the execution of this exception.

- C. Shop-Painting Applicators: Qualified according to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- E. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
 - 3. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
 - 4. AISC's "Specification for the Design of Steel Hollow Structural Sections."
 - 5. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
 - 6. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- F. Detailer: Shop drawings shall be prepared by a qualified detailer who has a minimum of five (5) years of documented experience detailing structural steel.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
- B. Channels, Angles, M-Shapes, S-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M, ASTM A 572/A 572M, Grade 50.

- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C.
- E. Steel Pipe: ASTM A 500, Grade C.
 - 1. Weight Class: As indicated on the plans.
 - 2. Finish: Black.
- F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
 - 1. Finish: Plain.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers, plain.
- C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.
- D. Threaded Rods: A 572/A 572M, Grade 50 (345), ASTM A 36/A 36M.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
 - 2. Washers: ASTM F 436 (ASTM F 436M) hardened.
 - 3. Finish: Plain.
- E. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.
- F. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

2.4 GROUT

- A. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404, Size No. 2. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- B. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.
- C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
 - 1. Camber structural-steel members where indicated.
 - 2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
 - 3. Mark and match-mark materials for field assembly.
 - 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.
 - 1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale and roughness.
 - 2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."
- G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
- H. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.
- I. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches (250 mm) o.c., unless otherwise indicated.
- J. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces.
 - 2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 - 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials.
 - 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.

1. Fill vent holes and grind smooth after galvanizing.
2. Galvanize lintels, shelf angles attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

- A. When required by the provisions of paragraph 1.6.B.1 of this specification, the Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
 2. The Fabricator shall reimburse the Owner for all costs and expenses associated with the performance of all Special Inspections carried out in the execution of the exception allowed in paragraph 1.6.B.1 of this specification.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 1. Liquid Penetrant Inspection: ASTM E 165.
 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 3. Ultrasonic Inspection: ASTM E 164.
 4. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
 1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
 2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
- B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of base plate.
 - 3. Snug-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 base or bearing plate before packing with grout.
 - 4. Promptly pack non-shrink grout solidly between bearing surfaces and base or bearing 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.
- C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. 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 is completed and in service.
- E. Splice members only where indicated.
- F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
- G. Do not use thermal cutting during erection.
- H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

- I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
 1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
 1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.

2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
- E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION 05120

SECTION 051213 - ARCHITECTURALLY EXPOSED STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes architecturally exposed structural-steel framing.
 - 1. Requirements in Division 05 Section "Structural Steel Framing" also apply to AESS framing.

1.2 DEFINITIONS

- A. Architecturally Exposed Structural Steel: Structural steel designated as "architecturally exposed structural steel" or "AESS" in the Contract Documents.

1.3 SUBMITTALS

- A. Shop Drawings: Show fabrication of AESS components.
 - 1. Indicate welds by standard AWS symbols. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.
 - 2. Indicate type, size, and length of bolts. Indicate orientation of bolt heads.
- B. Samples: Submit samples of AESS to set quality standards for exposed welds.
 - 1. Two steel plates, 3/8 by 8 by 4 inches (9.5 by 200 by 100 mm), with long edges joined by a groove weld.
 - 2. Steel plate, 3/8 by 8 by 8 inches (9.5 by 200 by 200 mm), with one end of a short length of rectangular steel tube, 4 by 6 by 3/8 inches (100 by 150 by 9.5 mm), welded to plate with a continuous fillet weld

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.
- B. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1, P2 and P3 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Use special care in handling to prevent twisting, warping, nicking, and other damage. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Where AESS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 BOLTS, CONNECTORS, AND ANCHORS

- A. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round-head assemblies.
 - 1. Finish: Mechanically deposited zinc coating.
- B. Corrosion-Resisting (Weathering Steel), Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 3, round-head assemblies.

2.2 PRIMER

- A. Primer: Comply with Division 09 painting Sections.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: ASTM A 780.

2.3 FABRICATION

- A. In addition to special care used to handle and fabricate AESS, comply with the following:
 - 1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes.
 - 2. Grind sheared, punched, and flame-cut edges smooth.
 - 3. Fabricate with exposed surfaces free of mill marks.
 - 4. Fabricate with exposed surfaces free of seams to maximum extent possible.
 - 5. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
 - 6. Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.
 - 7. Fabricate to the tolerances specified in AISC 303 for steel that **[is] [is not]** designated AESS.
 - 8. Seal-weld open ends of hollow structural sections with 1/4-inch (6.35-mm) closure plates.

- B. Curved Members: Fabricate indicated members to curved shape by rolling to final shape in fabrication shop.
 - 1. Distortion of webs, stems, outstanding flanges, and legs of angles shall not be visible from a distance of 20 feet (6 m) under any lighting conditions.
 - 2. Tolerances for walls of hollow steel sections after rolling shall be approximately 1/2 inch (13 mm).
- C. Coping, Blocking, and Joint Gaps: Maintain uniform gaps of 1/8 inch (3.2 mm) with a tolerance of 1/32 inch (0.8 mm).
- D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- E. Cleaning Corrosion-Resisting Structural Steel: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.4 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: As Indicated on the Plans.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work, and comply with the following:
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding specified tolerances.
 - 2. Use weld sizes, fabrication sequence, and equipment that limit distortions to allowable tolerances.
 - 3. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where AECS is exposed to weather.
 - 4. Provide continuous welds of uniform size and profile where AECS is welded.
 - 5. Grind butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus 0 inch (plus 1.5 mm, minus 0 mm).
 - 6. Make butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus 0 inch (plus 1.5 mm, minus 0 mm). Do not grind unless required for clearances or for fitting other components, or unless directed to correct unacceptable work.
 - 7. Remove backing bars or runoff tabs; back-gouge and grind steel smooth.
 - 8. At locations where welding on the far side of an exposed connection of AECS occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.
 - 9. Make fillet welds oversize and grind to uniform profile with smooth face and transition.

10. Make fillet welds of uniform size and profile with exposed face smooth and slightly concave. Do not grind unless directed to correct unacceptable work.

2.5 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
 1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 2. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
 3. Galvanize plates, lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.6 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 2. Surfaces to be field welded.
 3. Surfaces to be high-strength bolted with slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials.
 5. Galvanized surfaces.
- B. Surface Preparation for Nongalvanized Steel:

Chose the Surface Preparation that is appropriate for the specified coating system:

 1. SSPC-SP 3, "Power Tool Cleaning."
 2. SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
 3. SSPC-SP 14/NACE No. 8, "Industrial Blast Cleaning."
 4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
 5. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 6. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
- C. Preparing Galvanized Steel for Shop Priming: After galvanizing, thoroughly clean steel of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep AECS secure, plumb, and in alignment.
 - 1. If possible, locate welded tabs for attaching temporary bracing and safety cabling where they will be concealed from view in the completed Work.
- B. Set AECS accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
 - 1. Erect AECS to the tolerances specified in AISC 303 for steel that is designated AECS.
- C. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

3.3 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: As Indicated on the Plans.
 - 2. Orient bolt heads in same direction for each connection and to maximum extent possible in same direction for similar connections.
- B. Weld Connections: Comply with requirements in "Weld Connections" Paragraph in "Shop Connections" Article.
 - 1. Remove backing bars or runoff tabs; back-gouge and grind steel smooth.
 - 2. Remove erection bolts, fill holes, and grind smooth.
 - 3. Fill weld access holes and grind smooth.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect AECS as specified in Division 05 Section "Structural Steel Framing." The testing agency will not be responsible for enforcing requirements relating to aesthetic effect.

- B. Architect will observe AESS in place to determine acceptability relating to aesthetic effect.

3.5 REPAIRS AND PROTECTION

- A. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Grind steel smooth.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 051213

SECTION 05210 - STEEL JOIST 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. This Section includes the following (refer to drawings for joist types used):
 - 1. K-series steel joists.
 - 2. KCS-type K-series steel joists.
 - 3. K-series steel joist substitutes.
 - 4. LH-Series Long-span steel joists.
 - 5. Joist girders.
 - 6. Joist accessories.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for installing bearing plates in concrete.
 - 2. Division 4 Section "Unit Masonry" for installing bearing plates in unit masonry.

1.3 DEFINITIONS

- A. SJI "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
- B. Design special joists to withstand design loads with live load deflections no greater than the following:
 - 1. Floor Joists: Vertical deflection of 1/360 of the span.
 - 2. Roof Joists: Vertical deflection of 1/360 of the span.

1.5 SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product indicated.

- B. Shop Drawings: Show layout, designation, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, joist accessories; splice and connection locations and details; and attachments to other construction.
 - 1. Indicate locations and details of bearing plates to be embedded in other construction.
 - 2. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.
- C. Welding certificates.
- D. Manufacturer Certificates: Signed by manufacturers certifying that joists comply with requirements.
- E. Mill Certificates: Signed by bolt manufacturers certifying that bolts comply with requirements.
- F. Qualification Data: For manufacturer.
- G. Field quality-control test and inspection reports.
- H. Research/Evaluation Reports: For joists.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables of SJI "Specifications."
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. SJI Specifications: Comply with standard specifications in SJI's "Specifications" that are applicable to types of joists indicated.
- C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel: Comply with SJL's "Specifications" for web and steel-angle chord members.
- B. Steel Bearing Plates: ASTM A 36/A 36M.
- C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Plain, uncoated.
- D. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
 - 1. Finish: Plain.
- E. Welding Electrodes: Comply with AWS standards.

2.2 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.
- B. Primer: Provide shop primer that complies with Division 09 painting Sections.

2.3 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJL's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
 - 1. Joist Type: K-series steel joists and KCS-type K-series steel joists.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJL's "Specifications," with steel-angle or -channel members.
- C. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- D. Provide holes in chord members for connecting and securing other construction to joists.
- E. Top-Chord Extensions: Extend top chords of joists with SJL's Type S top-chord extensions where indicated, complying with SJL's "Specifications."
- F. Extended Ends: Extend bearing ends of joists with SJL's Type R extended ends where indicated, complying with SJL's "Specifications."
- G. Camber joists according to SJL's "Specifications."

- H. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.4 LONG-SPAN STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Camber long-span steel joists according to SJI's "Specifications."
- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.5 JOIST GIRDERS

- A. Manufacture joist girders according to "Standard Specifications for Joist Girders" in SJI's "Specifications," with steel-angle top- and bottom-chord members; with end and top-chord arrangements as indicated.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Provide holes in chord members for connecting and securing other construction to joist girders.
- D. Camber joist girders according to SJI's "Specifications."
- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.6 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.
- C. Bridging: Fabricate as indicated and according to SJI's "Specifications." Furnish additional erection bridging if required for stability.
- D. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. Shop prime paint.
- E. Steel bearing plates with integral anchorages are specified in Division 05 Section "Metal Fabrications."

- F. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch (13 mm) of finished wall surface, unless otherwise indicated.
- G. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.7 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply 1 coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.
- D. Shop priming of joists and joist accessories is specified in Division 09 painting sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts.

- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.
- B. Field welds will be visually inspected according to AWS D1.1/D1.1M.
- C. In addition to visual inspection, field welds will be tested according to AWS D1.1/D1.1M and the following procedures, as applicable:
 - 1. Radiographic Testing: ASTM E 94.
 - 2. Magnetic Particle Inspection: ASTM E 709.
 - 3. Ultrasonic Testing: ASTM E 164.
 - 4. Liquid Penetrant Inspection: ASTM E 165.
- D. Bolted connections will be visually inspected.
- E. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."
- F. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.
- G. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
 - 1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting sections.
- D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05210

SECTION 053100 - STEEL DECKING

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. Steel roof deck.
 - 2. Steel floor form deck.
- B. Related Sections include the following:
 - 1. Division 5 Section "Structural Steel" for supporting steel structure.
 - 2. Division 5 Section "Structural Steel" for framing deck openings with miscellaneous steel shapes.
 - 3. Division 5 Section "Steel Bar Joists" for supporting structure.

1.3 SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- C. Installation instructions: Submit deck manufacturer's installation instructions to the Architect/Engineer for review.
- D. Product Certificates: For each type of steel deck, signed by product manufacturer, certifying that their products comply with specified requirements.
- E. Field quality-control test and inspection reports.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Mechanical fasteners.
- G. Research/Evaluation Reports: For steel deck.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An installer with a minimum of five (5) years of documented experience completing steel deck erection Work similar in materials, design and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E329 for testing indicated
- C. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members".
- D. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approved Guide, Building Materials" for Class 1 fire rating and Class I-90 windstorm ratings.
- E. Steel Deck Institute (SDI) Publications: Comply with the requirements set forth in the following unless more stringent provisions are indicated in the Contract Documents.
 - 1. DDMD2, "SDI Diaphragm Design Manual"
 - 2. MOC1, "SDI Manual of Steel Construction"
 - 3. SDI "Standard Practice Details"
 - 4. SDI "Deck Damage and Penetrations"

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Steel Deck:
 - a. Epic Metals Corporation
 - b. Nucor Corp., Vulcraft Division
 - c. New Millennium Building Systems
 - d. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation
 - e. Metal Dek Group, a division of Consolidated Systems, Inc.

2.2 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230) G90 (Z275) zinc coating.
 2. Deck Profile: Type B, wide rib
 3. Profile Depth: 1-1/2 inches (38 mm)
 4. Design Uncoated-Steel Thickness: As indicated
 5. Span Condition: Triple span or more where possible
 6. Side Laps: Overlapped

2.3 ARCHITECTURAL ROOF DECK

- A. Steel Roof Deck: Fabricate panels, with or without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230) G90 (Z275) zinc coating.
 2. Deck Profile: Dovetail
 3. Profile Depth: 3-1/2 inches
 4. Design Uncoated-Steel Thickness: As indicated
 5. Span Condition: Triple span or more
 6. Side Laps: Overlapped
 7. Basis-of-Design Product: CSI Metal Dek Group; Versa-Dek® 3.5 LS Acoustic

2.4 ACOUSTICAL ROOF DECK

- A. Acoustical Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
1. Galvanized Steel Sheet: As Specified above in Section 2.2 or 2.3.
 2. Acoustical Deck Profile: As Specified above in Section 2.2 or 2.3.
 3. Profile Depth: As Specified above in Section 2.2 or 2.3.
 4. Design Uncoated-Steel Thickness: As indicated
 5. Span Condition: Triple span or more where possible.
 6. Side Laps: Overlapped
 7. Acoustical Perforations: Deck units with manufacturer's standard perforated vertical webs
 8. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber.
 9. Acoustical Performance: NRC 0.75, tested according to ASTM C 423.

2.5 NON-COMPOSITE FLOOR FORM DECK

- A. Non-composite Steel Form Deck: Fabricate ribbed-steel sheet non-composite form-deck panels to comply with "SDI Specifications and Commentary for Non-composite Steel Form Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G90 (Z275) zinc coating
2. Deck Profile: Type C
3. Profile Depth: 9/16 inches (14 mm)
4. Design Uncoated-Steel Thickness: As indicated
5. Span Condition: Simple span
6. Side Laps: Overlapped

2.6 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- I. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and sloped recessed pans of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field.
- J. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.
- K. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Welding of metal deck is prohibited on this project.
- I. Install 6-inch (minimum) wide steel cover plates, with same thickness and finish of deck, where deck changes span direction.
- J. Mechanical fasteners shall be used to fasten deck. Locate mechanical fasteners as indicated on the drawings, and install according to deck manufacturer's written instructions. Welding steel deck to supporting steel structure is prohibited on this project.

3.3 ROOF DECK INSTALLATION

- A. Mechanically fasten roof-deck panels to supporting steel structure.
 - 1. Fastener Size: No. 12 self-drilling, self-tapping screws. The Contractor shall select screws of sufficient length to completely engage the thickness of the supporting steel structure. The thread pitch shall be appropriate for the thickness of the supporting steel member.
 - 2. Fastener Spacing: As indicated on the drawings.
 - 3. Optional Fastener Systems: The Contractor may propose alternate fastening system such as Powder Actuated Fasteners or Pneumatically Driven Fasteners. The Alternate System must develop diaphragm shear capacity equal to or greater than that achieved by the specified system.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports as follows.
 - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws. Side lap fastener spacing shall be as indicated on the drawings.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
 - 1. End Joints: Lapped 2 inches (51 mm) minimum

- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches (305 mm) apart with at least one fastener at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Mechanically fasten to substrate to provide a complete deck installation.
 - 1. Mechanically fasten cover plates at changes in direction of roof-deck panels, unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05310

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Aluminum Roof ladders.
 - 2. Industrial Steel Stairs
 - 3. Miscellaneous steel trim including steel edgings.
 - 4. Loose bearing and leveling plates for applications where they are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related Requirements:
 - 1. Section 033000 "Concrete Work" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
 - 2. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
 - 3. Section 051200 "Structural Steel Framing."
 - 4. Section 077200 "Roof Accessories" for associated roof hatch.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for countertops.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Steel and Aluminum Ladders
4. Industrial Stairs
5. Miscellaneous steel trim including steel edgings.
6. Metal bollards.
7. Metal downspout boots.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders. Shopdrawing Submittal to include the Professional Engineer Stamp, licensed in the State of Kentucky.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.
- D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- E. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- F. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- G. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
- H. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- I. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- J. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- K. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).

2.3 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting."
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.6 METAL LADDERS

- A. General:
 - 1. Comply with ANSI A14.3.
- B. Aluminum Roof Ladders:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-approved equal:
 - a. Precision Ladders, LLC. (Basis of Design)
 - b. Royalite Manufacturing, Inc.
 - c. Thompson Fabricating, LLC.
 - 2. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
 - 3. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches (64 mm) deep, 3/4 inch (19 mm) wide, and 1/8 inch (3.2 mm) thick.

4. Provide platforms as indicated fabricated from pressure-locked aluminum bar grating or extruded-aluminum plank grating, supported by extruded-aluminum framing. Limit openings in gratings to no more than 1/2 inch (12 mm) in least dimension.
5. Support each ladder with welded or bolted aluminum brackets.
6. Provide aluminum cage at ladder from gym roof to lower roof.

2.7 INDUSTRIAL STAIRS AND ACCESS LADDER STEEL – (Primed & Painted)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-approved equal:
 1. Panel Built Incorporated (www.panelbuilt.com)
 2. Pacific Stair Corp.
 3. FSI Industries (www.fsindustries.com)
- B. Treads: Serrated from steel (6006-T5) plate to withstand minimum 1000-lb loading.
- C. Hand and Guardrails: Fabricate from 14 ga. steel spaced as required by fabricator to meet all Building Codes. All handrails and guards shall extend continuously.
- D. Stringers: 8 inch x 2.29 inch x 1/4 inch extruded steel channel. Stringer angle shall be as indicated on the drawings.
- E. Powder Coat Finish – Factory.
- F. Ladder Rungs: Fabricate from 14 ga. Steel space as detailed on drawings.

2.8 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize exterior miscellaneous steel trim.

2.9 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.

2.10 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.11 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.12 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.13 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

1. Do not fill removable bollards with concrete.

B. Anchor bollards in concrete in formed or core-drilled holes not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) larger than OD of bollard. Fill annular space around bollard solidly with nonshrink grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.

C. Fill bollards solidly with concrete, mounding top surface to shed water.

1. Do not fill removable bollards with concrete.

3.4 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting."

END OF SECTION 055000

SECTION 055213 - PIPE AND TUBE RAILINGS

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. Steel pipe and tube railings. (Interior and Exterior)
- B. Related Sections:
 - 1. Section 055100 "Metal Stairs" for steel tube railings associated with metal stairs.
 - 2. Section 057300 "Decorative Metal Railings" for ornamental railings fabricated from pipes and tubes.
 - 3. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring railings.
 - 4. Section 092216 "Non-Structural Metal Framing" for metal backing for anchoring railings.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Steel: 72 percent of minimum yield strength.
- C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

- B. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by a Kentucky licensed engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.8 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. 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.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.2 STEEL AND IRON

- A. Tubing: ASTM A 513.

- B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.3 FASTENERS

- A. General: Provide the following:
 - 1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 - 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
 - 3. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- E. Shop Primer for Galvanized Steel: Water based galvanized metal primer complying with MPI#134.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

- G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 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 flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Form changes in direction as follows:
 - 1. As detailed.
- J. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. For railing posts set in concrete, provide steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

2.6 FINISHES, GENERAL

- 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: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.7 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 1. Hot-dip galvanize steel and iron railings, including hardware, after fabrication.
 2. Hot-dip galvanize indicated steel and iron railings, including hardware, after fabrication.
 3. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 4. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
 5. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 6. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 1. Do not apply primer to galvanized surfaces.

- E. Shop-Painted Finish: Comply with Section 099113 – Exterior Painting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).
- C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill

annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

- C. Cover anchorage joint with flange of same metal as post, attached to post with set screws.

3.5 ATTACHING RAILINGS

- A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends.
- B. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
 - 4. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
 - 5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
 - 6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Rooftop equipment bases and support curbs.
 - 3. Wood blocking and nailers.
 - 4. Plywood backing panels.
- B. Related Requirements:
 - 1. Section 061600 "Sheathing."

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NHLA: National Hardwood Lumber Association.
 - 3. NLGA: National Lumber Grades Authority.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPAA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.

3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2.
 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawl spaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - 4. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

- E. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat items indicated on Drawings, and the following:
 - 1. Concealed blocking.
 - 2. Roof framing and blocking.
 - 3. Plywood backing panels.

2.4 DIMENSION LUMBER

- A. Framing Members: Construction or No. 2 grade and any of the following species:
 - 1. Hem-fir (north); NLGA.
 - 2. Mixed southern pine; SPIB.
 - 3. Spruce-pine-fir; NLGA.
 - 4. Hem-fir; WCLIB or WWPA.
 - 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 - 6. Eastern softwoods; NeLMA.

2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
- B. For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:
 - 1. Mixed southern pine, No. 3 grade; SPIB.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- E. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber with 19 percent maximum moisture content of any species.

2.6 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
 - B. Nails, Brads, and Staples: ASTM F 1667.
 - C. Power-Driven Fasteners: NES NER-272.
 - D. Wood Screws: ASME B18.6.1.
 - E. Screws for Fastening to Metal Framing: ASTM C 954, length as recommended by screw manufacturer for material being fastened.
 - F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
 - G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- 2.8 METAL FRAMING ANCHORS
- A. Hot-Dip Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
 1. Use for wood-preservative-treated lumber and where indicated.
- 2.9 MISCELLANEOUS MATERIALS
- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- E. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- F. Do not splice structural members between supports unless otherwise indicated.

- G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
 - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.
- I. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- J. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
- L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wall sheathing.
 - 2. Roof sheathing.
 - 3. Sheathing joint and penetration treatment.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for plywood backing panels.
 - 2. Section 072500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

2.2 WOOD PANEL PRODUCTS

- A. Plywood: DOC PS 1.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 WALL SHEATHING

- A. Plywood Wall Sheathing: Exterior sheathing.
 - 1. Span Rating: Not less than 24/0.
 - 2. Nominal Thickness: Not less than 3/8 inch (9.5 mm).
- B. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corporation; GlasRoc.
 - b. Georgia-Pacific Building Products; Dens-Glass Gold.
 - c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
 - d. United States Gypsum Company; Securock.
 - 2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
 - 3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

2.5 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exposure 1, Structural I sheathing.
 - 1. Span Rating: Not less than 24/0.
 - 2. Nominal Thickness: Not less than 1/2 inch (13 mm).

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
 - 1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - 1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

2.7 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
 - 1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
 - E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
 - F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
 - G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 1. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch (3 mm) apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 2. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
 3. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.
 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.
 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

SECTION 064100 - ARCHITECTURAL WOOD CASEWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications, apply to this Section.

1.02 SECTION INCLUDES

- A. Fabricated administration and media center reception desks including countertop, base cabinets, hardware, supports and associated accessories.
- B. Countertops not associated with modular casework or science casework.
- C. Media center tres.

1.03 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 099123- Interior Painting: Staining and transparent finishing on wood substrates.
- C. Section 123400 - Laminate Clad Casework: Casework Units and Hardware

1.04 REFERENCE STANDARDS

- A. ANSI A135.4 - American National Standard for Basic Hardboard; 2004.
- B. ANSI A208.1 - American National Standard for Particleboard; 1999.
- C. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2002.
- D. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.
- E. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.9).
- F. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation Meeting: Convene a pre-installation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.06 SUBMITTALS

- A. See Division 01, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- C. Product Data: Provide data for hardware accessories.

1.07 QUALITY ASSURANCE

- A. Perform work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards

Illustrated, Custom quality, unless other quality is indicated for specific items.

- B. Perform cabinet construction in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Custom quality, unless other quality is indicated for specific items.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
- D. Manufacturer Certification: Casework manufacturer shall be certified by the Architectural Woodwork Institute (AWI) Quality Certification Program and register this project with AWI/QPC.
 - 1. Work in the Section shall comply with the specified grades of work written herein and Sections 400 and 1600 of the current edition of Architectural Woodwork Institute Quality Standards.
 - 2. All casework provided under this Section must display AWI Quality Certification Labeling accordance with AWI/QCP labeling guidelines.

1.08 SUPPLIER QUALIFICATIONS:

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of experience.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Protect units during transit, delivery, storage, and handling to prevent damage.
- B. Do not deliver units until painting and similar operations that could damage, soil or deteriorate units have been completed in installation areas.
- C. If units will be stored at Project Site, store units only in areas whose environmental conditions meet requirements specified.

1.10 FIELD CONDITIONS

- A. Coordinate sizes and locations of blocking, furring, reinforcements and other related units of Work specified in other Sections to ensure that casework units can be supported and installed as indicated.
- B. Field Measurements: Where casework units will be fitted to other construction, verify dimensions with actual field measurements before fabrication, and indicate recorded dimensions on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Verify locations of concealed blocking, furring, reinforcements that support casework units by accurate field measurements before being enclosed. Record field measurements on final shop drawings.
- C. During and after installation of casework units, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 - PRODUCTS

2.01 PANEL MATERIALS

- A. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated; composed of wood fibers pressure bonded with moisture resistant adhesive to suit application; sanded faces; thickness as required.
 - 1. Use as backing for plastic laminate unless otherwise indicated.

2.02 LAMINATE MATERIALS

- A. Manufacturers:
 - 1. Formica Corporation: www.formica.com.
 - 2. Panolam Industries International, Inc\Nevamar: www.nevamar.com.

3. Wilsonart International, Inc: www.wilsonart.com.
 4. Substitutions: See Division 01
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- C. Provide specific types as follows:
1. Horizontal Surfaces: HGS, 0.048 inch (1.22 mm) nominal thickness, through color, color as selected, finish as selected by Architect from full range of H.D. and premium laminates.
 2. Vertical Surfaces: VGS, 0.028 inch (0.71 mm) nominal thickness, through color, color as selected, finish as selected by Architect from full range of H.D. and premium laminates.
 3. Post-Formed Horizontal Surfaces: HGP, 0.039 inch (1.0 mm) nominal thickness, color as selected, finish as selected by Architect from full range of H.D. and premium laminates.
 4. Cabinet Liner: CLS, 0.020 inch (0.51 mm) nominal thickness, through color, color as selected, finish as selected by Architect.
 5. Laminate Backer: BKH, (.048), (0.39), and (0.28) nominal thicknesses, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.
 6. Thermally-fused melamine laminate, NEMA LD 3-2005, color matched with white.

2.03 SOLID SURFACE MATERIALS

A. Manufacturers:

1. Subject to compliance with requirements, provide products by one of the following:
 - a. Corian® surfaces from the DuPont company (basis of design).
 - b. Wilsonart International; Division of Premark International, Inc.
 - c. Nevamar Company, LLC; Decorative Products Div.

B. Materials:

1. Solid polymer components
 - a. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
 - b. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.
2. Thickness:
 1. 1/2 inch- Refer to drawings.
3. Edge treatment:
 - a. Where exposed edges provide 1/4" chamfer. U.N.O.

C. Warranty:

1. Provide manufacturer's warranty against defects in materials.
 - a. Warranty shall provide material and labor to repair or replace defective materials.
 - b. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.
2. Optional Installed Warranty:
 - a. To qualify for the optional Installed Warranty, fabrication and installation must be performed by a Manufacturer Certified Fabrication/Installation source who will provide a brand plate for the application.
 - b. This warranty covers all fabrication and installation performed by the certified/approved source subject to the specific wording contained in the Installed Warranty Card.

3. Manufacturer's warranty period:

- a. Ten years from date of substantial completion.

2.04 MEDIA CENTER TREES

2.05 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
 - 1. Color: As selected by Sherman Carter Barnhart, PSC from manufacturer's standard range.
 - 2. Use at all exposed shelf edges.
- C. Fasteners: Size and type to suit application.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; chrome-plated finish in concealed locations and stainless steel, or chrome-plated finish in exposed locations.
- E. Concealed Joint Fasteners: Threaded steel.
- F. Grommets: Standard plastic grommets for cut-outs, in color as scheduled on drawings.
- G. Basis-of-Design: "WMO5L – 20" Nova Display Solutions. 1-1/2" medium-long satin chrome spacer, 5/8" diameter.

2.06 HARDWARE

- A. Hardware: BHMA A156.9, types as indicated for quality grade specified.
- B. Adjustable Shelf Supports: Standard back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome finish, for nominal 1 inch (25 mm) spacing adjustments.
- C. Drawer and Door Pulls: "U" shaped wire pull, plastic of to be selected color, 4 inch centers ("U" shaped wire pull, plastic of to be selected color, 100 mm centers).
- D. Master Keying: Provide individual rooms with master key; furnish 2 master keys per room keying the same for all room locks.
- E. Drawer Cabinet Locks: Removable core, disc tumbler, camstyle lock with strike.
- F. Sliding Door Locks: Disc-type plunger lock.
- G. Catches: Magnetic.
- H. Drawer Slides:
 - 1. Type: Standard extension.
 - 2. Static Load Capacity: Commercial grade.
 - 3. Mounting: Side mounted.
 - 4. Stops: Integral type.
 - 5. Features: Provide self closing/stay closed type.
 - 6. Manufacturers:
 - a. Accuride International, Inc: www accuride.com.
 - b. Grass America Inc: www.grassusa.com.
 - c. Knappe & Vogt Manufacturing Company: www.knappeandvogt.com.
 - d. Substitutions: See Division 01

- I. Hinges: Five knuckle, epoxy powder coated, institutional grade, 2 3/4" overlay type with hospital tip; 0.095 inch thick. ANSI-BHMA Standard A 156.9, Grade 1. Concealed 120-degree swing, self-closing, clip-on style.
 1. Manufacturers:
 - a. Grass America Inc: www.grassusa.com.
 - b. Hardware Resources: www.hardwareresources.com.
 - c. Julius Blum, Inc: www.blum.com.
 - d. Substitutions: See Division 01

2.07 FABRICATION

- A. Cabinet Style: Flush overlay.
- B. Cabinet Doors and Drawer Fronts: Flush style.
- C. Drawer Construction Technique: Dovetail joints.
- D. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- E. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- F. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- G. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet (600 mm) from sink cut-outs.
 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
 2. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- D. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.
- E. Metal Countertops- Provide per details in contract documents.

2.08 WOOD BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.
- b. Wood Cap: Where indicated in Drawings.
 1. Species: Red Oak
 2. Finish: Factory stain with premium transparent finish.

2.09 STAINING/ WOOD FILLER & VARNISH

- A. Interior Wood Stain: MPI #90.
 1. Sherwin Williams "Interior Oil Stain"
- B. Wood Filler Paste: MPI #91.
 1. Sherwin Williams "Sher-Wood Natural Wood Filler".
- C. Varnish, Interior, Polyurethane, Oil-Modified, Gloss (Gloss Level 6): MPI #56.
 1. Sherwin Williams "Wood Classics Polyurethane Clear Gloss".

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (1 mm). Do not use additional overlay trim for this purpose.
- E. Secure cabinets to floor using appropriate angles and anchorages.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION 064100

SECTION 066100 - GLASS FIBER REINFORCED RESIN UNITS (FRP)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Prefabricated glass fiber reinforced resin units include: Bracing, anchorage and framing accessories for metal framing and sealants are included in the work of this section. Decorative cornice, profile as indicated in drawings, bracing, anchorage, and framing accessories for metal framing and sealants are included in the work of this section.
- B. Related Sections include the following:
 - 2. Division 5 Section "Structural Steel" for structural-steel framing.
 - 3. Division 6 Section "Miscellaneous Rough Carpentry"
 - 5. Division 7 Section "Sheet Metal Flashing and Trim" for metal flashing and trim.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide manufactured assemblies complying with performance requirements indicated in Part 2, Article 2.2 Materials and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.
- B. Air Infiltration: Provide manufactured assemblies with permanent resistance to air leakage through assembly of not more than 0.45 L/s/sq. m of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 192 Pa.
- C. Water Penetration: Provide manufactured assemblies with no water penetration as defined in the test method when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward acting, wind-load design pressure of not less than 300 Pa and not more than 575 Pa.
- D. Structural Performance: Provide manufactured assemblies capable of withstanding design wind loads indicated under in-service conditions with deflection no greater than the following, based on testing manufacturer's standard units according to ASTM E 330 by a qualified independent testing and inspecting agency.
 - 1. Maximum Deflection: 1/180 of the span.

1.4 SUBMITTALS

- A. Product Data: Include manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.
- B. Shop Drawings: Show layouts of units, details of corner conditions, joints, panel profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between

factory- and field-assembled work. Indicate sizes and thicknesses of assemblies and framing components.

1. For installed products indicated to comply with certain design loadings, if any, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: Manufacturer's color charts or actual samples of material showing the full range of colors, textures, and patterns.
- D. Samples for Verification: Provide finished sample pieces 12 inches x 12 inches, in the thickness, color, and texture indicated.
- E. Submit manufacturer's current valid certification with the Certified Composites Technician (CCT) program of the American Composites Manufacturer's Association (ACMA). Submit manufacturer's internal Quality Control & Assurance Procedures based upon the "Guidelines and Recommended Practices for Fiberglass Reinforced Plastic Architectural Products".

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has successfully completed the installation of glass fiber reinforced resin unit projects similar in material, design, and extent to that indicated for this Project and with not less than a five year record of successful in-service performance.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated.
- C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated without delaying the Work, as documented according to ASTM E 699.
- D. Fire-Test-Response Characteristics: Where fire-resistance-rated wall panel assemblies are indicated, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Obtain FRP from a single source manufacturer with the ability and resources to comply with project requirements and schedule. Manufacturer shall comply with Quality Control & Assurance Procedures published in the "Guidelines and Recommended Practices for Fiberglass Reinforced Plastic Architectural Products".
- F. Manufacturer's Qualification: Provide products manufactured by a firm specializing in the manufacture of FRP ornamentation with a minimum of ten (10) years successful uninterrupted experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver assemblies and other components so they will not be damaged or deformed. Package assemblies for protection against damage during transportation or handling.
- B. Handling: Exercise care in unloading, storing, and erecting assemblies to prevent distortion such as bending, warping, twisting, and surface damage.

- C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store assemblies to ensure dryness. Do not store assemblies in contact with other materials that might cause distortion in any member, section or component of the assemblies, chipping, breaking, staining, denting, or other surface damage.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify location of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the exterior finish on assemblies within the specified warranty period and agreeing to repair finish or replace wall panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, color fade, chalking, chipping, breaking, cracking, peeling, and loss of integrity.
- C. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers supplying prefabricated glass fiber reinforced panels with specified physical and performance requirements include, and are limited to the following:
 - 1. First Class Building Products, 3600 Dallas Highway, Marietta, GA (770-514-8141)

2.2 MATERIALS

- A. Provide steel stud framing support members of the type, size, gauge and spacing as required by manufacturer to handle erection and installed loadings. The Contractor shall provide any reconfiguration or additional steel framing or wood blocking as required by the selected manufacturer.
- B. Framing member shall be formed from 18 ga. steel that meets the requirements of ASTM A 446, Grade D, with a minimum yield of 344.6 MPa and a G-60 galvanized protective coating. Manufacturer's certification to yield strength shall be furnished along with shop drawings and prior to placement of material on job site.
- C. Fiberglass units shall consist of glassfiber reinforced polyester composites with glass (containing a minimum #10 woven fiberglass cloth centrally located in binding plastic resin matrix) and thickness to meet the structural design as indicated on the drawings. Reinforced resin units shall be minimum 3/16" thickness at any point. Flat surfaces equal to or greater than 12" by 12" or any running surface equal to or greater than 9" in width, shall be fabricated with a minimum 1/4" thick sandwich core structure. Additional stiffeners and framing as required shall be embedded in the fiberglass composite to ensure straightness, strength, and profile

dimensional stability. Additional skeleton framing beyond that indicated will not be field provided. Any additional or reconfigured framing or blocking required by the manufacturer or installer required for proper installation shall be provided by the installer at no additional cost to the Owner. Units shall be attached to steel studs or wood blocking using non-corrosive fasteners as recommended by panel manufacturer.

- D. Matrix materials for unit surfacing shall consist of a thermosetting fire retardant co-polymer resin, and stable, non-fading paste pigments premixed in proper proportions to product panels that meet all specification requirements. Finish and matrix color shall match that of approved sample.
- E. Back-up Laminate: Polyester resin shall be fire retardant, meeting Glass I flame spread rating of 25 or less and smoke developed rating of 450 or less without the use of antimony trioxide as characterized by the ASTM E-84 tunnel test. General purpose resin shall not be permitted.
- F. Polymer concrete shall produce panels with the following minimum characteristics:

1. Compressive Strength	ASTM D 695	82.7 MPa
2. Tensile Strength	ASTM D 638	13.8 - 34.5 MPa
3. Water Absorption		Less than .1%
4. Coefficient of Expansion		$2.2 \times 10^{-6}/^{\circ}\text{C}$
5. Thickness		20 mm min.
- G. Color/Finish/Texture:
 - a. Column Wraps: Custom color and stone texture to match color and texture of stone masonry.
 - b. Roof Brackets: Custom color and smooth texture to match brackets installed at adjacent Central Hall 2.

2.3 RESIN UNIT ASSEMBLIES

- A. Exterior Resin Units: Fabricate one piece assemblies to the profile or configuration indicated; and of the material, finish, and thickness indicated. Design joints to accept joint sealants at locations as indicated on drawings or as recommended by manufacturer, or putty fill gelcoat as recommended by manufacturer, to form weathertight seals. Any deviation from joint pattern indicated must be approved by Architect.

2.4 MISCELLANEOUS MATERIALS

- A. Accessories: Unless otherwise specified, provide components required for a complete weathertight assembly.

2.5 FABRICATION

- A. General: Fabricate and finish assemblies and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Maintain plant records and quality control program during production of precast units. Make records available on request.
- C. Use rigid molds, constructed to maintain precast unit uniform in shape, size and finish.

- D. Utilize form liners to achieve design pattern.
- E. Maintain consistent quality during manufacture.
- F. Fabricate connecting devices, plates, angles, items to fit steel framing members inserts bolts and accessories. Fabricate to permit initial placement and final attachment.
- G. Embed anchors, inserts, plates and other cast-in items.
- H. Provide vents (refer to architectural drawings) to allow air movement as required by industry standards and applicable code. Vents shall consist of a regular pattern of holes integrally cast into the FRP. Provide securely mounted insect screen on concealed side.
- I. Locate hoisting devices to permit removal after erection.
- J. Cure units to develop concrete quality and to minimize appearance blemishes such as non-uniformity, staining or surface cracking.
- K. Minor patching in plant is acceptable providing structural adequacy and appearance of units is not impaired.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of wall panels.
 - 1. Supports and Anchorage: Examine wall framing to verify that backup framing, and other secondary structural panel support members and anchorage have been installed to meet requirements of panel manufacturer.
 - 2. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate installation of assemblies with and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

3.3 INSTALLATION

- A. General: Comply with manufacturer's written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor assemblies and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Assemblies shall be installed plumb and true, free of any warping or twisting, using procedures recommended by manufacturer.
 - 2. Lifting and installation of assemblies shall be done in a manner which will not cause distortion in any member.
- B. Accessories: Install components required for a complete assembly including flashings, backer rods and sealants.
- C. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not otherwise indicated, types recommended by manufacturer.

1. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."

3.4 CLEANING AND PROTECTING

- A. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by approved minor repair procedures.
- B. After the work of erection is completed, any damaged units shall be repaired in a neat and workmanlike manner. If not so repairable, they shall be replaced with new units. The cost of repairs and/or replacement shall be the responsibility of this Contractor unless damage has been caused by others.
- C. Cleaning: Clean up all debris resulting from the work at the end of each work day. Do not allow debris, tools or equipment to create a safety hazard to any personnel at any time. When all work has been completed, remove immediately all excess materials, tools and equipment and remove all debris resulting from work. On completion of installation, clean finished surfaces as recommended by manufacturer and maintain in a clean condition during construction.

END OF SECTION 066100

SECTION 070150.19 - PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof tear-off.
- B. Related Sections:
 - 1. Section 011000 "Summary" for use of the premises and phasing requirements.
 - 2. Section 015000 "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for reroofing preparation.
 - 3. Section 075423 "Foam Roofing" for new roof system installation.

1.3 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
- B. Existing Membrane Roofing System: Existing Built-Up roof system, including roof insulation, surfacing, and components and accessories between deck and roofing membrane. Note, the layer of iso adhered to the tectum is to remain.
- C. Roof Tear-Off: Removal of existing Built-up roof system from existing tectum deck. Existing deck to remain intact for installation of new roof system, refer to new work details for installation requirements.
- D. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.
- E. Existing to Remain: Existing items of construction that are not indicated to be removed.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning membrane roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Reroofing Conference: Conduct conference at Project site.
 - 1. Meet with Owner; Architect; Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; deck Installer; roofing Installer including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing system tear-off and replacement including, but not limited to, the following:
 - a. Reroofing preparation, including membrane roofing system manufacturer's written instructions.
 - b. Temporary protection requirements for existing concrete and steel roofing deck that is to remain during and after installation.
 - c. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Condition and acceptance of existing roof deck substrate for reuse.
 - e. Structural loading limitations of deck during reroofing.
 - f. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect reroofing.
 - g. Governing regulations and requirements for insurance and certificates if applicable.
 - h. Existing conditions that may require notification of Architect before proceeding.

1.6 PROJECT CONDITIONS

- A. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- B. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
- C. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
- D. Hazardous Materials: It is not expected that hazardous materials such as asbestos-containing materials will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

PART 2 - PRODUCTS

2.1 AUXILIARY REROOFING MATERIALS

- A. General: Auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of new spray foam roofing system.
- B. Metal Flashing Sheet: Metal flashing sheet is specified in Section 076200 "Sheet Metal Flashing and Trim."

PART 3 - EXECUTION

3.1 PREPARATION

- A. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- B. Verify that rooftop utilities and service piping have been shut off before beginning the Work.

3.2 ROOF TEAR-OFF

- A. Roof Tear-Off: Remove existing roofing and roofing system components down to the deck.
 - 1. Remove fasteners from deck or cut fasteners off slightly above deck surface.

3.3 DECK PREPARATION

- A. Inspect deck after tear-off of roofing system.
- B. If broken or loose fasteners that secure deck panels to one another or to structure are observed or if deck appears or feels inadequately attached, immediately notify Architect. Do not proceed with installation until directed by Architect.
- C. If deck surface is not suitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect. Do not proceed with installation until directed by Architect.
- D. Provide additional deck securement as indicated on Drawings.

3.4 EXISTING BASE FLASHINGS

- A. Remove existing base flashings around parapets, curbs, walls, and penetrations.
 - 1. Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.

3.5 DISPOSAL

- A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
 - 1. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 070150.19

SECTION 071113 - BITUMINOUS DAMPPROOFING

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, emulsified-asphalt dampproofing.

1.3 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- 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. ChemMasters, Inc.
 - 2. Degussa Building Systems; Sonneborn Brand Products
 - 3. Tremco Company
 - 4. Meadows, W. R., Inc.
 - 5. Tamms Industries, Inc.
- B. Trowel Coats: ASTM D 1227, Type II, Class 1.
- C. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
- D. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.2 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
- D. Patching Compound: Asbestos-free fibered mastic of type recommended in writing by dampproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.
- C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches (150 mm) over outside face of footing.
 - 1. Extend dampproofing 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.

- C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch (6 mm) onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
 - 1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
 - 2. Lap dampproofing at least 1/4 inch (6 mm) onto shelf angles supporting veneer.
- D. Where dampproofing interior face of above-grade, exterior concrete and masonry walls, continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by dampproofing wall before constructing intersecting walls.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Masonry Backup for Metal Panel Assemblies, Brick Veneer Assemblies and Stone Veneer Assemblies: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

3.5 CLEANING

- A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 071113

SECTION 071900 - WATER REPELLENTS

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 penetrating water-repellent treatments for the following vertical and horizontal surfaces:
 - 1. Cast stone.
 - 2. Clay brick masonry.
 - 3. Calcium Silicate
 - 4. Split face CMU

1.3 QUALITY ASSURANCE

- A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.
- B. Mockups: Apply water repellent to each type of substrate required.
 - 1. Locate each test application as directed by Architect.
 - 2. Size: 10 sq. ft. (9.3 sq. m).
 - 3. Final approval by Architect of water-repellent application will be from test applications.
- C. Pre-installation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 PENETRATING WATER REPELLENTS

- A. Silane, Penetrating Water Repellent: Clear, containing 20 percent or more solids of alkyltrialkoxysilanes; with alcohol, mineral spirits, water, or other proprietary solvent carrier; and with 400 g/L or less of VOCs.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Advanced Chemical Technologies, Inc; Sil-Act ATS-100.
 - b. BASF Corporation; Construction Systems; MasterProtect H 400 (Pre-2014: Enviroseal 40).
 - c. Nox-Crete Products Group; Stifel GC.
 - d. Pecora Corporation; KlereSeal 9100-S.

- e. Tamms; a brand of Euclid Chemical Company; an RPM Company; Barcade Silane 100.
- B. Siloxane, Penetrating Water Repellent: Clear, containing 10 percent or more solids of oligomeric alkylalkoxysiloxanes; with alcohol, ethanol, mineral spirits, water, or other proprietary solvent carrier; and with 400 g/L or less of VOCs.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Chemical Products Industries, Inc; CP-500W.
 - b. ChemMasters, Inc; Aquanil Plus WB.
 - c. Diedrich Technologies, Inc.; a division of Sandell Construction Solutions; 303-C.
 - d. Euclid Chemical Company (The); an RPM company; Euco-Guard VOX.
 - e. SaverSystems; DEFY Water Repellent for Brick.
 - f. Specco Industries, Inc; Waterstopper S-10 WB Siloxane.
 - g. Tamms; a brand of Euclid Chemical Company; an RPM Company; Barcade M.E..
- C. Silane/Siloxane-Blend, Penetrating Water Repellent: Clear, silane and siloxane blend with 400 g/L or less of VOCs.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corporation; Construction Systems.
 - b. L&M Construction Chemicals, Inc; Aquapel.
 - c. Pecora Corporation; KlereSeal 910-W.
 - d. PROSOCO, Inc; Saltguard WB.
 - e. Tamms; a brand of Euclid Chemical Company; an RPM Company; Barcade WB 244.
 - f. Tnemec Inc; Dur A Pell 10.
 - g. Wacker Chemical Corporation; Silres BS 1001A.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
 - 1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in three representative locations by method recommended by manufacturer.
 - 2. Inspect for previously applied treatments that may inhibit penetration or performance of water repellents.
 - 3. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
 - 4. Verify that required repairs are complete, cured, and dry before applying water repellent.
- B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions and as follows:
 - 1. Cast Stone: Remove oil, curing compounds, laitance, and other substances that inhibit penetration or performance of water repellents according to ASTM E 1857.
 - 2. Clay Brick Masonry: ASTM D 5703.
 - 3. Calcium Silicate Masonry: As recommended by manufacturer.
- B. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.

3.3 FIELD QUALITY CONTROL

- A. Testing of Water-Repellent Material: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when water repellent is being applied:
 - 1. Owner will engage the services of a qualified testing agency to sample water-repellent material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will perform tests for compliance of water-repellent material with product requirements.
 - 3. Owner may direct Contractor to stop applying water repellents if test results show material being used does not comply with product requirements. Contractor shall remove noncomplying material from Project site, pay for testing, and correct deficiency of surfaces treated with rejected materials, as approved by Architect...
- B. Coverage Test: In the presence of Architect, hose down a dry, repellent-treated surface to verify complete and uniform product application. A change in surface color will indicate incomplete application.
 - 1. Reapply water repellent until coverage test indicates complete coverage.

3.4 CLEANING

- A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.
- B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 071900

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Foam-plastic board insulation.
 - 2. Glass-fiber blanket insulation.
 - 3. Mineral-wool blanket insulation.
 - 4. Loose-fill insulation.
- B. Related Sections:
 - 1. Section 042000 "Unit Masonry" for insulation installed in cavity walls and masonry cells.
 - 2. Section 061600 "Sheathing" for foam-plastic board sheathing over wood or steel framing.
 - 3. Section 078446 "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DiversiFoam Products Dow: The Dow Chemical Company
 - b. Kingspan Insulation.
 - c. Owens Corning.
 2. Type VI, 40 psi (276 kPa).
- B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. CertainTeed Corporation.
 2. Johns Manville; a Berkshire Hathaway company.
 3. Owens Corning.
 4. Knauf Insulation
- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- C. Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).
- D. Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

2.3 MINERAL-WOOL BLANKET INSULATION

- A. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.4 LOOSE-FILL INSULATION

- A. Glass-Fiber Loose-Fill Insulation: ASTM C 764, Type I for pneumatic application; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

2.5 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

- 1. Products: Subject to compliance with requirements, provide one of the following:

- a. AGM Industries, Inc; Series T TACTOO Insul-Hangers.
 - b. Gemco; Spindle Type.

- 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
 - 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.

- B. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

- 1. Products: Subject to compliance with requirements, provide one of the following:

- a. AGM Industries, Inc; TACTOO Adhesive.
 - b. Gemco; Tuff Bond Hanger Adhesive.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical footing and foundation wall surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.
- B. On horizontal surfaces under slabs, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in from exterior walls.

3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- D. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.
- E. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.5 INSTALLATION OF STOREFRONT AND CURTAINWALL INSULATION

- A. Install board insulation in storefront and curtain-wall construction where indicated on Drawings according to storefront and curtain-wall manufacturer's written instructions.
 1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
 2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

3.6 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072119 - FOAMED-IN-PLACE 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. Closed-cell spray polyurethane foam.
 - 2. Open-cell spray polyurethane foam.
- B. Related Requirements:
 - 1. Section 042000 "Unit Masonry" for preparation of cavity walls and masonry accessories for installation of spray-applied insulation.

1.3 INFORMATIONAL SUBMITTALS

- A. Quality Assurance Program: Submit evidence of current accreditation of the subcontractor and certification of the installers under the Air Barrier Association of America's (ABAA) Quality Assurance Program. Submit accreditation number of subcontractor and certification number of installers.
- B. Product Data: Submit manufacturer's product data, manufacturer's printed instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.
 - 1. Submit letter from primary materials manufacturer indicating approval of products not manufactured by primary manufacturer.
 - 2. Include statement that materials are compatible with adjacent materials proposed for use.
 - 3. Submit reports indicating that field peel-adhesion test on all materials to which sealants are adhered have been performed and the changes made, if required, to other approved materials, in order to achieve successful adhesion.
- C. Samples: Submit labeled samples, 3 by 4 inch (75 mm by 100 mm) minimum size of each material specified.
- D. Shop Drawings: Submit shop drawings showing locations and extent of air barrier assemblies and details of typical conditions. Drawings shall indicate manufacturer's recommended closures of gaps in wall construction, counter-flashings, integrity of insulation thickness at corners, and sealing of miscellaneous conduit, piping, electrical rough-in boxes and similar items are sealed.
- E. Compatibility: Submit letter from manufacturer stating that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials

proposed for use. Submit letter from manufacturer stating that cleaning materials used during installation are chemically compatible with adjacent materials proposed for use.

- F. Provide a list of recommended sealants at location in contact with membrane flashings.

1.4 QUALITY ASSURANCE

- A. Air Barrier Subcontractor Qualifications: Installer shall be accredited by the Air Barrier Association of America (ABAA).
 - 1. Installer shall be certified by BPQI (Building Performance Quality Institute) in accordance with the training requirements outlined in the ULC S705.2-05 Installation Standard.
 - 2. Installer shall have at least 3-years of successful experience in application of spray polyurethane foam. Installer must be a NCIF Gola Star certified insulation contractor or have SPF manufacturer's certification for the application.
- B. Equipment: Installer shall have equipment to spray-apply polyurethane foam including, but not limited to, high pressure plural component proportioning pump, heated hoses of suitable length, spray gun, drum pumps or other ancillary equipment necessary for the Project.
- C. Manufacturer: Obtain primary materials from a single manufacturer regularly engaged in manufacturing air barrier membranes. Obtain secondary materials from a source acceptable to the primary materials manufacturer.
- D. Accredited Laboratory Testing for Materials: Laboratory accredited by International Accreditation Service Inc. (IAS), American Association for Laboratory Accreditation (A2LA), or the Standards Council of Canada (SCC).
- E. Field Quality Assurance: Implement the ABAA Quality Assurance Program requirements. Cooperate with ABAA inspectors and independent testing and inspection agencies engaged by the Owner. Do not cover air barrier until it has been inspected, tested and accepted.
- F. Preconstruction Meeting: Agenda shall include, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original packages or containers with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.
- B. Store materials in their original undamaged packages or containers in a clean, dry, protected location and within temperature range required by air barrier membrane manufacturer. Protect stored materials from direct sunlight.
- C. Handle materials in accordance with manufacturer's recommendations.

1.6 PROJECT CONDITIONS

- A. Temperature: Install air barrier within range of ambient and substrate temperatures recommended by air barrier manufacturer. Do not apply air barrier to a damp or wet substrate.

- B. Field Conditions: Do not install air barrier in snow, rain, fog, or mist. Do not install air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

1.7 WARRANTY

- A. Material Warranty: Provide manufacturer's standard product warranty, for a minimum 3 years from date of Substantial Completion.
- B. Installation Warranty: Provide air barrier subcontractor's 2 year warranty from date of Substantial Completion, including all components of the air barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of adhesion, loss of cohesion, failure to cure properly.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

- A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 1.5 lb/cu. ft. (24 kg/cu. m) and minimum aged R-value at 1-inch (25.4-mm) thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F (43 K x sq. m/W at 24 deg C).
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation.
 - b. Dow Chemical Company (The).
 - c. Henry Company.
 - d. Icynene Inc.
 - 2. Surface-Burning Characteristics: Comply with ASTM E 84; 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: 450 or less.
 - 3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 OPEN-CELL SPRAY FOAM INSULATION

- A. Manufacturer's
 - 1. Same as listed for closed-cell foam.
- B. R-Value = 3.7 per 1" thickness.
- C. Installation to occur where indicated in drawing.

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.
- B. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for spray polyurethane foam.
 - 1. Ensure that penetrating work by other trades is in place and complete.
 - 2. Prepare surfaces by brushing, scrubbing, scraping, or grinding to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants, which may affect adhesion of the spray polyurethane foam.
 - 3. Wipe down metal surfaces to remove release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the spray polyurethane foam.
 - 4. Ensure masonry veneer anchors are in place.
 - 5. Test substrate with Moisture Detection Paper (MDP) strips to affirm that the substrate is dry.
- C. Prime substrate for application of sheet membrane transition strips as recommended by manufacturer and as follows:
 - 1. Prime masonry, concrete substrates with conditioning primers.
 - 2. Prime glass-fiber surfaced gypsum sheathing an adequate number of coats to achieve required bond, with adequate drying time between coats.
 - 3. Prime wood, metal, and painted substrates with primer.
 - 4. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air barrier and at protrusions.
- D. Protection from Spray Applied Materials:
 - 1. Mask and cover adjacent areas to protect from over spray.
 - 2. Ensure any required foam stop or back up material are in place to prevent over spray and achieve complete seal.
 - 3. Seal off existing ventilation equipment. Install temporary ducting and fans to ensure exhaust fumes. Provide for make-up air.
 - 4. Erect barriers, isolate area and post warning signs to advise non-protected personnel to avoid the spray area.

3.2 INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.

- B. Spray insulation to envelop entire area to be insulated and fill voids.
- C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.
- D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.
- E. Cavity Walls: Install into cavities to thickness indicated on Drawings.
- F. Miscellaneous Voids: Apply according to manufacturer's written instructions.
- G. Transition Strip Installation: Install transition strip materials to provide continuity throughout the building envelope. Install materials in accordance with manufacturer's recommendations and the following:
 - 1. Apply primer for transition strips at rate recommended by manufacturer. Allow primer to dry completely before transition strip application. Apply as many coats as necessary for proper adhesion.
 - 2. Position subsequent sheets of transition strips applied above so that membrane overlaps the membrane sheet below by a minimum of 2 inches (50 mm), unless greater overlap is recommended by manufacturer. Roll into place with roller.
 - 3. Overlap horizontally adjacent pieces of transition strips a minimum of 2 inches (50 mm), unless greater overlap is recommended by manufacturer. Roll seams with roller.
 - 4. Seal around all penetrations with a transition strip or other procedure in accordance with manufacturer's recommendations.
 - 5. Connect air barrier in exterior wall assembly continuously to the air barrier of the roof, to concrete below-grade structures, to windows, curtain wall, storefront, louvers, exterior doors, penetrations, and other intersection conditions using transition membranes and in accordance with the manufacturer's recommendations.
 - 6. At changes in substrate plane, provide transition material recommended by manufacturer to make a smooth transition from one plane to another.
 - 7. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Membrane shall be continuously supported by substrate.
 - 8. At through-wall flashings, provide an additional 6-inch wide strip of manufacturer's recommended membrane counter-flashing to seal top of through-wall flashing to membrane. Seal exposed top edge of strip with bead of mastic as recommended by manufacturer.
 - 9. At deflection and control joints, provide backup for the membrane to accommodate anticipated movement.
 - 10. At expansion joints provide transition to the joint assemblies.
 - 11. Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams, rough cuts, and as recommended by the manufacturer when membrane will be exposed to the elements.
 - 12. At end of each working day, seal top edge of self-adhered membrane to substrate with termination mastic if exposed.
 - 13. Do not allow materials to come in contact with chemically incompatible materials.
 - 14. Do not expose transition membrane to sunlight longer than as recommended by the manufacturer.
 - 15. Inspect installation prior to enclosing assembly and repair damaged areas with spray polyurethane foam as recommended by manufacturer.
 - 16. At flashing installation for aluminum frame jamb and sills, refer to architectural details for recessing flashing.
- H. Spray Application of Polyurethane: Install materials in accordance with manufacturer's recommendations, ULC S705.2 and the following:

1. Equipment used to spray polyurethane foam shall comply with ULC S705.2 and the manufacturer's recommendations for the specific type of application. Record equipment settings on the Daily Work Record as required by the ULC S705.2 installation standard. Each proportioner unit shall supply only one spray gun.
2. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer and the ULC S705.2 Installation standard.
3. Apply in consecutive passes as recommended by manufacturer to thickness as indicated on drawings. Passes shall be not less than 1/2 inch and not greater than 2 inches. An additional pass of 2 inches shall only be done after the first pass has had time to cool down. At no time shall more than 4 inches be installed in a single day.
4. Install within manufacturer's tolerances, but not more than minus 1/4 inch or plus 1/2 inch.
5. Do not install spray polyurethane foam within 3 inches of heat emitting devices such as light fixtures and chimneys.
6. Finished surface of foam insulation to be free of voids and embedded foreign objects.
7. Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.
8. Trim any excess thickness, provide the 3/4" minimum clearance to back of face brick or ground face concrete masonry units.
9. Clean and restore surfaces soiled or damaged by work of the section. Consult with section of work soiled before cleaning to ensure methods used will not damage the work.
10. Complete connections to other components and repair any gaps, holes or other damage using material, which conforms to ULC S710.1 or ULC S711.1 and installed in accordance with ULC S710.2 or ULC S711.2 as applicable.

3.3 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
 1. Coordinate with installation of materials which cover spray polyurethane foam air barrier, to ensure exposure period does not exceed that recommended by the manufacturer.
- B. Clean all spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

END OF SECTION 072119

SECTION 072500 - WEATHER BARRIERS

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. Building wrap.
 - 2. Flexible flashing.
- B. Related Requirements:
 - 1. Section 061600 "Sheathing" for sheathing joint and penetration treatment.

1.3 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.

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, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Chemical Company (The); Styrofoam Weathermate Plus Brand Housewrap.
 - b. DuPont Building Innovations: E. I. du Pont de Nemours and Company; Tyvek CommercialWrap.
 - c. Kingspan Insulation; GreenGuard C2000.
 - d. Soprema, Inc; Air & Vapor Barrier.
 - 2. Water-Vapor Permeance: Not less than 75 perms (4300 ng/Pa x s x sq. m) per ASTM E 96/E 96M, Desiccant Method (Procedure A).
 - 3. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg (0.02 L/s x sq. m at 75 Pa) when tested according to ASTM E 2178.
 - 4. Allowable UV Exposure Time: Not less than three months.

- 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, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advanced Building Products Inc; Wind-o-wrap.
 - b. Carlisle Coatings & Waterproofing Inc; CCW-705-TWF Thru-Wall Flashing.
 - c. Grace Construction Products; W.R. Grace & Co. -- Conn; Vycor Plus Self-Adhered Flashing.
 - d. Polyguard Products, Inc.
- B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.
- C. Nails and Staples: ASTM F 1667.

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.
 - 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. Prime substrates as recommended by flashing manufacturer.
 - 2. 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.
 - 3. Lap flashing over water-resistive barrier at bottom and sides of openings.
 - 4. Lap water-resistive barrier over flashing at heads of openings.

5. 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 074113.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes standing-seam metal roof panels.
- B. Related Sections:
 - 1. Section 077253 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface, allowing it to melt and drain off slowly.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
 - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 - 5. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
 - 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 - 7. Review temporary protection requirements for metal panel systems during and after installation.
 - 8. Review procedures for repair of metal panels damaged after installation.
 - 9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.
- E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Panel Applicator Warranty: Applicator shall submit a written warranty executed by applicator to repair or replace components of metal panel system that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.
- C. Special Watertightness Warranty: Manufacturer's non-prorated warranty in which manufacturer agrees to repair or replace standing-seam metal roof panel system components, and associated trim, that fail to remain watertight within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 1680 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).
- B. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).
- C. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

- D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

2.2 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.

- B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels as indicated in drawings: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 0.028 inch (0.71 mm).
 - b. Exterior Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
3. Clips: One-piece fixed to accommodate thermal movement.
 - a. Material: 0.064-inch-(1.63-mm-) nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
4. Panel Coverage: 18 inches (457 mm).
5. Panel Height: 2 inches.

2.3 UNDERLAYMENT MATERIALS

- A. Felt Underlayment: ASTM D 226/D 22M, Type II (No. 30), asphalt-saturated organic felts.

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated.

Provide manufacturer's standard sections as required for support and alignment of metal panel system.

- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 - 2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-(25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch-(2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match roof fascia and rake trim.
- E. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot-(3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.
- F. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.6 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 - 1. 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.
 - 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
 2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
 - B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
 - C. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 PREPARATION
- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.
- 3.3 UNDERLAYMENT INSTALLATION
- A. Felt Underlayment: Apply at locations indicated below, in shingle fashion to shed water, and with lapped joints of not less than 2 inches (50 mm).
 1. Apply over the entire roof surface.
 2. Apply on roof not covered by self-adhering sheet underlayment. Lap over edges of self-adhering sheet underlayment not less than 3 inches (75 mm), in shingle fashion to shed water.
 - B. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."
- 3.4 METAL PANEL INSTALLATION
- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

- B. Fasteners:
1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
 2. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
 3. Copper Panels: Use copper, stainless-steel, or hardware-bronze fasteners.
 4. Stainless-Steel Panels: Use stainless-steel fasteners.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
1. Install clips to supports with self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 4. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.
- G. 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 as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used

or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

- H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced 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.
- I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.
 - 1. Provide elbows at base of downspouts to direct water away from building.
 - 2. Connect downspouts to underground drainage system indicated.
- J. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113.16

SECTION 074213.19 - MODULAR METAL WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Concealed fastener, coil coated, rainscreen wall panel as part of the wall assemblies described in Section 2.1.

1.2 RELATED REQUIREMENTS

- A. Division 07 air barrier section for transition and flashing components of building air/moisture barrier.
- B. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items.
- C. Division 07 Section "Joint Sealants" for field-applied joint sealants.

1.3 REFERENCE STANDARDS

- A. American Architectural Manufacturer's Association (AAMA):
 - 1. AAMA 620 - Voluntary Specification High Performance Organic Coatings on Coil Coated Architectural Aluminum.
 - 2. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- C. ASTM International (ASTM):
 - 1. ASTM B 209 - Specification for Aluminum and Aluminum Alloy Sheet and Plate.
 - 2. ASTM B 221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 3. ASTM D 3359 - Standard Test Methods for Measuring Adhesion by Tape Tests.
 - 4. ASTM E 329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
 - 5. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide modular metal wall panel system meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.
- B. Structural Performance: Design modular metal wall panel system fabricated to withstand the effects of wind loads under conditions indicated below.

1. Wind Loads: Determine loads based on uniform pressure, building category, exposure category, and basic wind speed indicated on drawings.
 2. Air/Moisture Barrier: Refer to Division 07 "Air Barrier" section.
- C. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum 10 years' experience in manufacture of similar products in successful use in similar applications.
1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
 - a. Product data, including certified independent test data indicating compliance with requirements.
 - b. Samples of each component.
 - c. Sample submittal from similar project.
 - d. Project references: Minimum of 5 installations not less than 5 years old, with Owner and Architect contact information.
 - e. Sample warranty.
 2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
 3. Approved manufacturers must meet separate requirements of Submittals Article.
- B. Wall Systems Installer Qualifications: Experienced Installer with minimum of 5 years' experience with successfully completed projects of a similar nature and scope.
- C. Mockups: Build mockup in size and location as directed by Architect. Show details of modular metal panel system. Demonstrate methods and details of installation. Show details of vertical joints, penetrations, doors, windows, louvers, pipe openings, inside and outside corners, top and bottom of wall, horizontal and vertical joints.
1. Approval of mockup does not relieve Contractor of responsibility to comply with all requirements of contract documents.
 2. Approved mockup may become part of installation if approved by Architect.

1.6 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's technical representative, and other trade contractors.
1. Coordinate building framing in relation to modular metal panel system.
 2. Coordinate installation of building air and water barrier behind composite wall panel system.
 3. Coordinate window, door and louver, and other openings and penetrations of modular metal panel system.

1.7 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets for specified products.

- B. Shop Drawings: Provide shop drawings prepared by manufacturer or manufacturer's authorized dealer. Include full elevations showing openings and penetrations. Include details of each condition of installation and attachment. Provide details at a minimum scale 3-inch per foot of all required trim and extrusions needed for a complete installation
 - 1. Include data indicating compliance with performance requirements.
 - 2. Indicate points of supporting structure that must coordinate with modular metal panel system installation.
- C. Field Measurements not by CENTRIA: It is the panel installer's responsibility to verify locations of structural members, adjoining construction and wall openings dimensions by field measurement before panel fabrication and indicate measurements on final shop drawings.
- D. Samples for Initial Selection: For each product specified including sealants and gaskets. Provide representative color charts of manufacturer's full range of colors.
- E. Samples for Verification: Provide 24-inch (600 mm) section of wall panel showing, horizontal joinery, vertical joint return, panel stiffener and anchoring details. Provide 12-inch (300 mm) long pieces of each extruded aluminum trim.

1.8 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Indicating compliance of products with requirements, from a qualified independent testing agency.
- B. Qualification Information: For Installer and Installer's field supervisor.
- C. Manufacturer's warranty: Submit sample warranty.

1.9 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect products of modular metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage.
 - 1. Deliver, unload, store, and erect modular metal wall panel system and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.

1.11 WARRANTY

Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal wall panel assemblies that fail in materials and workmanship within [two] years from date of Substantial Completion.

- 1. Failures include, but are not limited to the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.

- B. Special Panel Finish Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace wall panels that display evidence of deterioration of finish within [20] years from date of Substantial Completion.

1. Exposed Panel Finish: Deterioration includes, but is no 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.

PART 2 - PRODUCTS

2.1 System Description

- A. Modular metal wall panel system consisting of aluminum panels in a rainscreen application as part of the assembly described below.

1. **Modular Metal Wall Panels over Multi-Component Framed Wall System:** Modular metal wall panels applied as exterior rainscreen cladding over wall framing specified in Division 05 Section "Cold-Formed Metal Framing" with exterior sheathing specified in Division 06 Section "Sheathing", an applied membrane that provides air, moisture, and water vapor control specified in Division 07 Section "Air Barriers", and insulation within the framing specified in Division 07 Section "Thermal Insulation". Metal wall panel installation specified in this Section includes [secondary metal subgirt framing and] mounting clips for panel attachment.
 - a. Water-resistive barrier is provided under Division 07 Section "Weather Barriers."
 - b. Air, moisture, and water vapor control membrane is provided under Division 07 Section "Air Barriers."
2. **Modular Metal Wall Panels over Masonry Wall System:** Modular metal wall panels applied as exterior rainscreen cladding over a masonry wall [and rigid board insulation] specified in Division 04 Section "Unit Masonry" and an applied membrane that provides air, moisture, and water vapor control specified in Division 07 Section "Air Barriers". Metal wall panel installation specified in this Section includes secondary metal subgirt framing for panel attachment.
 - a. Water-resistive barrier is provided under Division 07 Section "Weather Barriers."
 - b. Air, moisture, and water vapor control membrane is provided under Division 07 Section "Air Barriers."

2.2 MANUFACTURERS

- A. Basis of Design: **CENTRIA Intercept Entyre Modular Metal Wall Panel System.** Provide basis of design product, or comparable product approved by Architect prior to bid.
1. CENTRIA Architectural Systems; Moon Township, PA 15108-2944. Tel: (800)759-7474. Tel: (412)299-8000. Fax: (412)299-8317. Email: info@CENTRIA.com. Web: www.CENTRIA.com.
 2. Kingspan

3. Fabrel

2.3 MATERIALS

- A. Aluminum Sheet: Smooth surface coil-coated sheet, ASTM B209, 3105-H14 Alloy.

1. Aluminum Material: Tension-leveled
2. Thickness: 0.060" nominal
3. Weight: Approximately 1.5 lb. per square foot

2.4 Modular Metal Panels

- A. Modular Metal Panels: Factory-formed, aluminum-faced panels fabricated from 0.60" thick aluminum coil coated sheet.

1. Panel Depth: 1-3/8"(35mm).
2. Panel Flatness: Maximum allowable distortion: 1/32 inch in 24 inches (0.813 mm in 610 mm) in any direction. Panel lines, breaks, and angles shall be sharp and true, and surfaces shall be free from warp or buckle.
3. Clips: Manufacturer's standard clips as required to meet performance requirements.
4. Panel Joints: 3/4"(19mm)
5. Panel Sizes: 24" Panel Module with lengths indicated on drawings.

- B. Sheet Surface: Smooth.

- C. Aluminum Face Sheet Coil-Coated Finish:

1. Fluoropolymer Three-Coat System: 0.8 mil primer with 0.8 mil 70 percent PVDF fluoropolymer color coat, and a 0.8 mil 70 percent PVDF fluoropolymer clear coat, AAMA 621.

- a. Basis of Design: **CENTRIA Duragard Plus.**

2. Color: As selected by Architect from manufacturer's full range of colors. Three colors total, refer to building elevations for color locations.

- D. Unexposed Finish: Manufacturer's standard nominal 0.5 mil nominal DFT backer coating...

- E. Exposed Trim, flashings and Fastener Finish: Match panel finish.

1. Thickness: 0.060" nominal
2. Refer to section 07 6200

2.5 SECONDARY METAL FRAMING

- A. Miscellaneous Framing Components, General: Cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z180) hot-dip galvanized zinc coating.

1. Hat Channels: 0.048 inch/18 ga. (1.22 mm) minimum nominal thickness.
2. Sill Channels: 0.048 inch/18 ga. (1.22 mm) minimum nominal thickness.

2.6 ACCESSORIES

- A. Provide manufacturer's factory-formed clips, shims, flashings, sealants, and tapes for a complete installation.

2.7 FABRICATION

- A. General: Fabricate modular metal panels and accessories at factory identical to tested units using manufacturer's standard procedures and processes necessary to meet performance requirements.
 - 1. Provide components of modular metal panel system that are products of one manufacturer, including modular metal panels, head and sill trim, bottom weep, starter flash, and metal copings.
- B. Modular Metal Panels: Fabricate modular metal panels requiring no further fabrication or modification in field.
 - 1. Horizontal Joints: Dry seal, drained and back ventilated.
 - 2. Vertical Joints: Pre-formed returns
 - 3. Reveals: 3/4"(19mm)
 - 4. Standard System Depth: 1-3/8"(35mm)

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine modular metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of modular metal panel system.
 - 1. Inspect framing that will support modular metal panel system to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to modular metal wall panel system manufacturer.
 - a. Maximum deviations acceptable to modular metal panel system manufacturer:
 - 1) 1/4-inch in 20 feet (6.4 mm in 6 m) vertically or horizontally from face plane of framing.
 - 2) 1/2-inch (12.7 mm) maximum deviation from flat substrate on any building elevation.
 - 3) 1/8-inch in 5 feet (3.2 mm in 1.5 m).
 - 2. Confirm presence of acceptable framing members to match installation requirements of modular metal panel system.
 - a. Confirm framing minimum .048 inch/18 ga. (1.22 mm) at maximum 24 inch (610 mm) spacing.
 - 3. Verify that window, door, louver and other penetrations match layout on shop drawings.
- B. Advise General Contractor of out-of-tolerance work and other deficient conditions prior to proceeding with modular metal wall panel system installation.

3.2 MODULAR METAL PANEL SYSTEM INSTALLATION

- A. General: Install modular metal panel system in accordance with approved shop drawings and manufacturer's recommendations.
- B. Installation: Attach panels to metal sub-framing using recommended clips, screws, fasteners, sealants, and adhesives indicated on approved shop drawings.
 - 1. Horizontal Joinery: Working from base of installation to top, connect upper panel to lower panel at joinery.
 - 2. Vertical Joinery: Provide reveal between vertical ends of panels as shown on shop drawings.
 - 3. Galvanic Action: Where elements of modular metal wall system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.
- C. Rainscreen Installation: Proceed with installation of manufacturer's dry seal horizontal joinery. Keep open spaces in horizontal joinery intended to ventilate cavity behind system.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a service representative authorized by metal wall panel manufacturer to inspect completed installation. Submit written report. Correct deficiencies noted in report.

3.4 CLEANING AND PROTECTION

- A. Remove temporary protective films within 2 weeks of erection. Clean finished surfaces as recommended by metal wall panel manufacturer. Clear weep holes and drainage channels of obstructions, dirt, and sealant. Maintain in a clean condition during construction.
- B. Replace damaged panels and accessories that cannot be repaired by field repair.

END OF SECTION 074213.19

SECTION 075700 - COATED FOAMED ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Extent of sprayed insulating roofing systems work is indicated on drawings and by requirements of this section. Extent of work includes but is not limited to
 - 1. Spray-applied, polyurethane foam insulation.
- B. Related Sections:
 - 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking, and nailers.
 - 2. Division 07 Section "Sheet Metal Flashing and Trim" for foam stops, roof penetration flashings, and counterflashings.
 - 3. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 PERFORMANCE REQUIREMENTS

- A. Watertightness: Provide coated foamed roofing that is watertight and will not permit the passage of water.
- B. Material Compatibility: Provide polyurethane foam, elastomeric coatings, and miscellaneous roofing materials that are compatible with one another and able to bond to substrate under conditions of service and application required, as demonstrated by coated foamed roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Provide a coated foamed roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to Factory Mutual I-90 wind uplift rating.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties.
- B. Samples for Initial Selection: For roof coating colors.
- C. Samples for Verification: For coated foamed roofing, prepared on Samples of size indicated below:

1. Samples, 24 by 24 inches, on rigid backing, showing polyurethane foam of thickness required and stepped coatings in colors required to illustrate buildup of coated foamed roofing.
- D. Qualification Data: For SPFA-qualified Installer and applicators.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for coated foamed roofing.
- F. Field quality-control reports.
- G. Maintenance Data: For coated foamed roofing to include in maintenance manuals.
- H. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing product systems specified in this Section with a minimum twenty (20) years experience. Manufacturer's to have at least a Dun & Bradstreet rating of 5A or greater as well as minimum net worth of 200 million dollars.
- B. Installer: Firm specializing in performing work of this Section with a minimum of twenty (20) years experience with a minimum of (20) million square feet successfully installed. Installer must be approved applicator by Manufacturer providing the warranty, and is capable of receiving specified (20) year NDL roof warranty.
 1. Applicator shall be currently fully accredited by the SPFA (Spray Polyurethane Foam Alliance) for a minimum of at least (10) years, prior to submitting their bid on this project.
 2. Applicator to be located and have maintained an office within 100 miles of the jobsite for at least the last ten years.
 3. Applicator to provide 100% payment & performance bond to General Contractor for this portion of their Contract... if applicable.
 4. Applicator to provide a list of at least (5) jobs similar in size, dollar amount and scope, which have been completed within the last (3) years prior to submitting their bid on this project.
 5. Applicator to carry a minimum (8) million dollar insurance umbrella for their portion of this project.
 6. Applicator to ensure all supervising personal onsite has 30-hour O.S.H.A cards.

1.6 INDEPENDENT ROOF INSPECTION SERVICES

1. SCOPE:
 - a. The Contractor is to provide and facilitate complete services for third party quality control roof inspections for all new roofing installations.
 - b. Services must be as follows:
 1. Review and approval of roofer's qualifications.
 2. Review and approval of roof shop drawings and action plan.

3. Attendance and documentation of pre-roofing conference inspections, directions and conclusions. Documentation shall include electronic photographs of all deficiencies.
4. Attendance and documentation of min. 18 periodic roofing progress review meeting/inspections, including all follow-up directions, and conclusions. Contractor shall be responsible for all required follow-up return inspections including post project review visits to address failures, including scheduling and any additional inspection costs.
5. Attendance and documentation of post-roofing inspection to include notice of any deficiencies with electronic photographs.

2. INDEPENDENT ROOF INSPECTOR'S QUALIFICATIONS

- a. Roof inspector must be independent and not affiliated nor not aligned with any roof mfr. roof distributor, or contractor.
 - b. Roof inspector shall have been in business a min. of 10 years and have min. 5 years experience in inspections of projects of similar size and roof system(s).
 - c. Roof inspector must at a min., have 75% of work per year providing inspection services.
 - d. Roof inspector must be RCI certified and RRC accredited or member in good standing with NRCA.
 - e. Roof inspector shall carry professional liability insurance, with the following minimum amount of \$500,000.00 per claim and \$1,000,000.00 aggregate per annum.
 - f. Roofing contractor shall submit roof inspector's qualifications and confirmation of familiarity and experience with specified/provided roof type and manufacturer.
 - g. Roofing contractor shall submit qualifications and references of roof inspector indicating compliance with the above requirements.
3. The roofing contractor is to facilitate and coordinate third party roof inspections with the Construction Manager/General Contractor, Owner and Architect with notice given of meetings or inspections at least one week in advance.
 4. The roofing contractor is to photo document each day's work including general views and detail photographic views of the progress and electronically transmit to third party on a daily basis. Contractor to provide additional photos or documentation as requested by third party inspectors. Third party inspectors to review photos daily and document observations, concerns, and necessary corrections to the roofing contractor, general contractor and Architect within 24 hours.
 5. Repetitive faulty work performed by the roofing contractor may require additional on site visits by third party inspectors. All inspector fees/costs due to additional inspections are the responsibility of the contractor. Additional inspections may be required by the architect upon the receipt of two notices of concern provided by the third party inspector.
 6. Contractor to cooperate and coordinate with a representative of the Roof Manufacturer to attend the pre-roofing conference and post roofing inspection.
 7. The roofing contractor shall be responsible for coordination, review and confirmation that all corrective work is performed per roof covering manufacturer standards, for compliance with warranty requirements
 8. **Warranty** commences upon substantial completion provided that all deficiencies noted by manufacturer's representatives, third party inspector, and Architect are completed. If deficiencies have not been corrected by the date of substantial completion the warranty will begin upon the date the deficiency repairs are completed and have been accepted

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire resistance ratings of roof assembly.

1.8 PRE-INSTALLATION CONFERENCE

- A. Conduct conference at Project site minimum one week prior to beginning Work of this Section. Comply with requirements in Division 1 Section "Preconstruction Conferences."
- B. Review installation procedures and coordination required with related work, including manufacturer's WRITTEN INSTRUCTIONS.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store liquid materials and other products in their original unopened containers or packaging until ready for installation.
- B. Materials shall be clearly labeled with the manufacturer's name, product identification, safety information, and batch or lot numbers where appropriate.
- C. Store materials out of the weather and out of direct sunlight in locations where the temperatures are within limits specified by manufacturer.
- D. Protect stored products from ambient temperatures below 75 degrees F.
- E. Comply with the manufacturer's instructions and SPFA for handling and safety procedures.
- F. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's limits.
- B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- C. Do not install foam insulation under the following conditions:
 - 1) When ambient temperature is below 55 degrees F or above 110 degrees F.
 - 2) When relative humidity is above 95 percent.
 - 3) When wind velocity is above 10 mph, unless windscreens are utilized.
 - a) Installer to have onsite a windscreen to be used when needed.
 - 4) When raining.
 - 5) At temperature less than 5 degrees F above dew point.
- D. Do not install protective silicone overcoat under the following conditions:
 - 1) When ambient temperature is below 40 degrees F.
 - 2) When wind velocity is above 10 mph, unless windscreens are utilized.
 - 3) Installer to have onsite a windscreen to be used when needed.

- 4) When raining.
- 5) At temperature less than 5 degrees F above dew point.

1.11 WARRANTY

- A. **Special Watertight Warranty:** Submit a written **no-dollar limit, non pro-rated**, warranty executed by manufacturer agreeing to repair or replace foam system components and associated trim, that fails to remain watertight within the specified warranty period. Watertight warranty includes roofing materials, base flashings, roofing accessories, roof insulation, fasteners, cover boards, walkway products and other components of roofing system.
 1. Watertight Warranty Period: 20 years from date of Substantial Completion. (Refer to additional requirements in Independent Roof Inspection Services)
- B. **Special Roof Installer's Warranty:** Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including all components of roofing system such as roofing foam, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
 1. Warranty Period: Two years from date of Substantial Completion. (Refer to additional requirements in Independent Roof Inspection Services)

2 PRODUCTS

2.1 Coated Foamed Roofing – Acceptable Manufacturers

- A. General Electric
- B. Bayer Chemical

2.2 SUBSTRATE BOARD

- A. N/A.

2.3 ROOF BOARD INSULATION

- A. Polyisocyanurate: ASTM C1289, Type II, felt or glass-fiber mat on both major surfaces; minimum 20 psi compressive strength. R-value of polyisocyanurate insulation shall be based on LTTR 6 per inch of thickness. Thickness to be 1.5"
- B. Insulation Overlay Board: 1/2 inch thick wood fiber board (recovery board) as manufactured by Celotex or as approved by coated foamed roofing manufacturer to maintain specified warranty.

2.4 FOAM INSULATION MATERIALS

- A. Foam Insulation: Two component, closed-cell, rigid-class urethane foam, sprayed-in-place, with the following properties:
 - 1) Density: ASTM D1622; 2.7 to 3.2 pounds per cubic foot.
 - 2) Compressive Strength: ASTM D1621; 40 psi.
 - 3) Tensile Strength: ASTM D1623, 80 psi.
 - 4) Closed Cell Content: ASTM D2856, 90 percent, minimum.
 - 5) Dimensional Stability: ASTM D2126, plus 8 percent maximum volume change at 28 days, 158 degrees F, 100 percent relative humidity.

- 6) Thermal Conductivity: ASTM C518, K factor of 0.15, aged.
- 7) Surface Burning Characteristics: ASTM E84, 75 maximum.
- 8) Smoke Developed Index: ASTM E84, 450 Maximum.

B. Substrate Primer: As required by roofing system manufacturer.

2.5 SILICONE MATERIALS

A. Overcoat: Silicone base and top coats with granulated surface complying with the following:

- 1) Tensile Strength: ASTM D412, 450.
- 2) Elongation: ASTM D412, 150 percent minimum at break at 75 degrees F.
- 3) Water Vapor Permeance: ASTM E398, 2.9 at 20 mils.
- 4) Fire resistance: ASTM E108, UL 790 Class A.
- 5) Color: Light Gray or Tan... Owner to select topcoat color.
- 6) Granulated surface: For cover coat complying with manufacturer's requirements.

2.6 ACCESSORIES

- A. Cant: Spray applied foam insulation, filleted to interruptions and penetrations through the roof surface.
- B. Sealant: Type recommended by the roofing system manufacturer.
- C. Fasteners: Mechanical fasteners with plates as approved by roofing system manufacturer and in compliance with FM 4450 per I-90 wind uplift requirements.
- D. Walkway Pads: Provide yellow spaghetti, breathable type mesh pads where indicated on Drawings.

3 EXECUTION

3.1 EXAMINATION

- A. Verify deck surface is smooth and dry and deck joints do not exceed 1/16 inch. Verify deck slope prior to beginning installation.
- B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
- C. Verify that concrete substrate is cured with moisture content not exceeding 12 percent. (if applicable)
- D. Verify that metal deck has no gaps and laps are closed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION – GENERAL

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving the best result for the substrate under project conditions indicated.
- C. Roof Board Insulation: Prevent materials from getting wet.

- D. Schedule work after penetrations through roof are complete and perimeter conditions are ready to receive roof system.
- E. Comply with SPFA applicable guidelines.
- F. Prevent materials from entering and clogging roof drains and from migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- G. Mask off adjacent surfaces that are not scheduled to receive foam.

3.3 PREPARATION - METAL DECK

- A. Install insulation with fasteners recommended by roofing system manufacturer to achieve wind uplift requirements specified for roofing system.
 - 1) Butt insulation ends firmly together along all edges without gaps or openings.
 - 2) Protect cover board from getting wet after installation and prior to being protected by foam cover board that has been exposed to moisture must be replaced.
 - 3) Remove loose dirt and debris by using compressed air, vacuum or light brooming.
 - 4) Protect installed cover board from spills of contaminants such as oil, grease, solvents, etc. Replace cover board that has been exposed to such contaminants.
 - 5) Remove materials or substances that will interfere with total adhesion of foam insulation to substrate.
 - 6) Mask off adjacent surfaces that are not scheduled to receive foam.

3.4 SUBSTRATE BOARD INSTALLATION

- 1. N/A.

3.5 ROOF BOARD INSULATION INSTALLATION

- A. Coordinate installation of roof board insulation components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Install insulation to conform to slopes indicated. (see details)
- C. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 - 1) Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- D. Mechanically Fastened Insulation: Install all layers of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1) Fasten insulation according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
 - 2) Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
- E. Install overlay board over insulation with long joints in continuous straight lines with end joints staggered between rows. Loosely butt cover boards together and fasten to roof deck.

- 1) Fasten cover boards according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
- 2) Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.6 FOAM INSULATION INSTALLATION

- A. Apply primer and foam insulation in accordance with manufacturer's written installation instructions.
- B. Install foam insulation in multiple layers with minimum pass thickness of 1/2 inch.
 - 1) Thickness: 1 1/2 inches unless otherwise indicated on Drawings.
 - 2) Provide positive slope for drainage. (See details for tapered insulation board)
- C. Install foam up vertical applications at walls with high/low roof intersections where noted and detailed. Foam on vertical applications to maintain minimum thickness noted in details to provide and weather tight enclosure. Contractor to coordinate installation and flashing with the varying vertical substrates including ICF, CMU, and Gyp Sheathing over metal studs.
- D. Extend foam 2 inches up vertical intersections, fillet insulation, and feather out.
 - 1) Form a cant of foam at perpendicular interruptions.
- E. Apply foam to permit first coat of overcoat within 24 - 36 hours. If this time limit is exceeded, prepare foam skin surface in accordance with manufacturer's written instructions.
- F. Develop finish skin surface to smooth and unbroken "orange peel" texture.
 - 1) Uneven surfaces, "tree bark" or "popcorn" textures are not acceptable.

3.7 FLASHINGS AND ACCESSORIES

- A. Coordinate installation of related flashings.
- B. Seal flashings and flanges of items penetrating roofing system.
- C. Install flexible walkway pads in locations indicated on Drawings. Adhere walkway products to substrate with compatible adhesive recommended by roofing system manufacturer.

3.8 SILICONE COATING INSTALLATION

- A. Install coating in accordance with manufacturer's instructions.
- B. Prepare and seal penetration through roof with sealant.
- C. Apply silicone coating in two coats with dissimilar colors for each coat to a total dry mil thickness of 25 mils minimum.
- D. Extend overcoat to cover foam insulation and extend 2 inches above foam termination on protrusions to a self-terminating, water seal.
- E. Install granules in topcoat at rate recommended by manufacturer.

3.9 FIELD QUALITY CONTROL

- A. Owner will engage the services of an independent party to periodically inspect roofing installation. Roofing system installer shall cooperate with personnel performing inspections. (If applicable)

- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

- 1) Notify Architect and Owner 48 hours in advance of date and time of inspection.

- C. Repair or remove and replace components of roofing system where inspection results indicate that they do not comply with specified requirements.

3.10 CLEANING

- A. Clean work under provisions of Division 1. Remove overspray from adjacent surfaces using cleaning agents and procedures recommended by manufacturer of affected construction.
- B. Remove excess insulation or overcoat from finished surfaces.
- C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.
- D. Repair or replace defaced or disfigured finishes caused by work of this section.

3.11 PROTECTION OF FINISHED WORK

- A. Protect finished work under provisions of Division 1.
- B. Ensure roof surface is free of traffic for minimum two (2) days after overcoat application.

3.12 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

- 1. Owner: <Insert name of Owner.>
 - 2. Address: <Insert address.>
 - 3. Building Name/Type: <Insert information.>
 - 4. Address: <Insert address.>
 - 5. Area of Work: <Insert information.>
 - 6. Acceptance Date: <Insert date.>
 - 7. Warranty Period: <Insert time.>
 - 8. Expiration Date: <Insert date.>

- B. AND WHEREAS Roofing Installer has contracted as a subcontractor to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

- D. This Warranty is made subject to the following terms and conditions: Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a) lightning;
 - b) peak gust wind speed exceeding 90 mph (m/sec);
 - c) fire;

- d) failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e) faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f) vapor condensation on bottom of roofing; and
 - g) activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
- E. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
- F. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
- G. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
- H. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
- I. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
- J. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

IN WITNESS THEREOF, this instrument has been duly executed this **<Insert day>** day of **<Insert month>**, **<Insert year>**.

1. Authorized Signature: **<Insert signature.>**
2. Name: **<Insert name.>**
3. Title: **<Insert title.>**

END OF SECTION 075700

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed wall sheet metal fabrications.
5. Formed equipment support flashing.
6. Gutters, Downspouts, Exposed Trim, Metal Fascia and Metal Copings

- B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 074213.19 "Insulated Metal Wall Panels" for installation of sheet metal flashing integral with wall panels.
3. Section 075423 "Thermoplastic Polyolefin (TPO) Roofing" for installation of sheet metal flashing and trim integral with roofing.

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

- B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Include details for forming, including profiles, shapes, seams, and dimensions.
3. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.

4. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches (1:5).

C. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
1. For copings and roof edge flashings that are FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.8 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 5 years from date of Substantial Completion.
- B. Project Installation Guarantee: Submit written agreement, signed by the Installer and Contractor, guaranteeing to correct failures in product, workmanship and watertightness for a period of 2 years from date of Substantial Completion without reducing or otherwise limiting other rights to correction which the Owner may have under the Contract Documents. Failure is

defined as faulty workmanship or product failure which leads to interruption of a watertight installation. The total system, no dollar limit guarantee, shall cover work of this section in its entirety.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 - 2. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 - 1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Color: As selected by Architect from manufacturer's full range.
 - 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; with smooth, flat surface.
 - 1. Finish: 2D (dull, cold rolled).
- D. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 (Z275) coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Surface: and mill phosphatized for field painting.
 - 2. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 3. Color: As selected by Architect from manufacturer's full range.
 - 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 - 4. Fasteners for Zinc-Tin Alloy-Coated Stainless-Steel Sheet: Series 300 stainless steel.
 - 5. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
 - 6. Fasteners for Zinc Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Solder:
 - 1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

2. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Acceptable Manufacturers: Subject to compliance with the requirements, provide products by one of the following:
 1. Fry Reglet Corporation
 2. Hickman: W.P. Hickman Co.
 3. Keystone Flashing Company
- B. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with interlocking counterflashing on exterior face, of same metal as reglet.
 1. Material: Galvanized steel, 0.022 inch (0.56 mm) thick.
 2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
 4. Accessories:
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
 5. Finish: Mill.
- C. Hanging Gutters: Fabricate hanging gutters from the following material.
 1. GalvanizedSteel: 0.0336 inch (22 ga.) (0.855 mm) thick.

D. Downspouts: Fabricate downspouts from the following material.

1. Galvanized Steel: 0.0217 inch (26 ga.) (0.55 mm) thick.

E. Copings: Fabricate from the following material:

1. Galvanized Steel: 0.0336 inch (22ga) (0.85mm) thick.

F. Drip Edges: Fabricate from the following material:

1. Galvanized Steel: 0.0217 inch (26 ga) (0.55 mm) thick.

G. Equipment Support Flashing: Fabricate from the following material:

1. Galvanized Steel: 0.0276 inch (24 ga.) (0.7 mm) thick

H. Roof Penetration Flashing: Fabricate from the following material:

1. Galvanized Steel: 0.0276 inch (24 ga) (0.7 mm) thick

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection.

1. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- H. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- I. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-(2400-mm-) long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
 - 1. Expansion Joints: Lap type.
 - 2. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
 - 3. Gutters with Girth 31 to 35 Inches (790 to 890 mm): Fabricate from the following materials:
 - a. Galvanized Steel: 0.052 inch (1.32 mm) thick.
- B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
 - 1. Fabricated Hanger Style: Fig 1-35A according to SMACNA's "Architectural Sheet Metal Manual."
 - 2. Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch (0.56 mm) thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Copings: Fabricate in minimum 96-inch-(2400-mm-) long, but not exceeding 12-foot-(3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, solder or weld watertight. Shop fabricate interior and exterior corners.
 - 1. Coping Profile: Fig 3-4D according to SMACNA's "Architectural Sheet Metal Manual."
 - 2. Joint Style: Provide a 2" minimum and 4" maximum overlap with bed of sealant per SMACNA Plate 68, Alternate No. 2.
 - 3. Fabricate from the Following Materials:
 - a. Galvanized Steel: 0.040 inch (1.02 mm) thick (22 ga.).

- B. Roof Expansion-Joint Cover: Fabricate from the following materials: Shop fabricate interior and exterior corners.
 - 1. Galvanized Steel: 0.034 inch (0.86 mm) thick (22 ga.).
- C. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 - 1. Galvanized Steel: 0.028 inch (0.71 mm) thick (24 ga.).
- D. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 - 1. Galvanized Steel: 0.022 inch (0.56 mm) thick (26 ga.).
- E. Flashing Receivers: Fabricate from the following materials:
 - 1. Galvanized Steel: 0.022 inch (0.56 mm) thick (26 ga.).

2.8 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch-(50-mm-)high, end dams. Fabricate from the following materials:
 - 1. Galvanized Steel: 0.022 inch (0.56 mm) thick (26 ga.).

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
 - 1. Galvanized Steel: 0.028 inch (0.71 mm) thick (24 ga.).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings,

separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 5. Torch cutting of sheet metal flashing and trim is not permitted.
 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- E. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. Hanging Gutters: Join sections with joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
1. Fasten gutter spacers to front and back of gutter.

2. Anchor and loosely lock back edge of gutter to continuous cleat.
 3. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches (600 mm) apart.
 4. Anchor gutter with gutter brackets spaced not more than 36 inches (910 mm) apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
 5. Anchor gutter with spikes and ferrules spaced not more than 30 inches (760 mm) apart.
 6. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet (15.24 m) apart. Install expansion-joint caps.
 7. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.
- B. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in asphalt roofing cement or elastomeric sealant compatible with the substrate.
- C. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches (100 mm) in direction of water flow.

3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints minimum of 4 inches (100 mm). Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 077200 - ROOF 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. Roof hatches.
- B. Related Sections:
 - 1. Section 055000 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
 - 2. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - 1. Size and location of roof accessories specified in this Section.
 - 2. Method of attaching roof accessories to roof or building structure.
 - 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
 - 4. Required clearances.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

- A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
 - 1. Exposed Coil-Coated Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
 - 2. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
- B. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), manufacturer's standard alloy and temper for type of use, finished to match assembly where used, otherwise mill finished.
- C. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.
- D. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.
- E. Steel Tube: ASTM A 500, round tube.
- F. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123/A 123M.
- G. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

- B. Glass-Fiber Board Insulation: ASTM C 726, thickness as indicated.
- C. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Underlayment:
 - 1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
 - 2. Polyethylene Sheet: 6-mil-(0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
 - 3. Slip Sheet: Building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum, rosin sized.
- E. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 - 1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
 - 4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- G. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- H. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.3 ROOF HATCH

- A. Roof Hatches: Metal roof-hatch units with lids and insulated single-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
 - a. Babcock-Davis; Personnel Roof Hatch (BRHP).
 - b. Bilco Company (The); TYPE L SERVICE STAIR ACCESS.
 - c. Precision Ladders, LLC.
- B. Type and Size: Single-leaf lid. Refer to Roof Plan and Details.
- C. Loads: Minimum 40-lbf/sq. ft. (1.9-kPa) external live load and 20-lbf/sq. ft. (0.95-kPa) internal uplift load.

- D. Hatch Material: Aluminum sheet, 0.090 inch (2.28 mm) thick.
 - 1. Finish: Mill.
- E. Construction:
 - 1. Insulation: 3" thick Polyisocyanurate board with an R-Value = 18.
 - 2. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
 - 3. Fabricate curbs to minimum height of 12 inches (300 mm) unless otherwise indicated.
- F. Hardware: Stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
 - 1. Provide two-point latch on lids larger than 84 inches (2130 mm).
- G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
 - 1. Height: 42 inches (1060 mm) above finished roof deck.
 - 2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches (31 mm) in diameter or galvanized-steel tube, 1-5/8 inches (41 mm) in diameter.
 - 3. Flat Bar: Galvanized steel, 2 inches (50 mm) high by 3/8 inch (9 mm) thick.
 - 4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches (533 mm) in diameter.
 - 5. Chain Passway Barrier: Galvanized proof coil chain with quick link on fixed end.
 - 6. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
 - 7. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
 - 8. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
 - 9. Fabricate joints exposed to weather to be watertight.
 - 10. Fasteners: Manufacturer's standard, finished to match railing system.
 - 11. Finish: Manufacturer's standard.
 - a. Color: As selected by Architect from manufacturer's full range.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof-Hatch Installation:
 - 1. Install roof hatch so top surface of hatch curb is level.
 - 2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
 - 3. Attach safety railing system to roof-hatch curb.
 - 4. Attach ladder-assist post according to manufacturer's written instructions.
- D. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.
- B. Clean off excess sealants.
- C. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 078100 - APPLIED FIREPROOFING

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 sprayed fire-resistive materials (SFRM).

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Framing plans, schedules, or both, indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of fireproofing.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F (7 deg C) or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction and the following VOC limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.
 - 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
- E. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

- A. SFRM: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application or conveyed in a dry state and mixed with atomized water at place of application.
 - 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. Carboline Company, subsidiary of RPM International, Fireproofing Products Div.; Pyrolite 15.
 - b. Grace, W. R. & Co. - Conn.; Grace Construction Products; Monokote MK-6 Series and Retro-Guard.
 - c. Isolatek International; Cafco 300, Cafco 300 SB, and Cafco Blaze-Shield II.
 - d. Southwest Fireproofing Products Co.; Type 5 Series.
 - 2. Bond Strength: Minimum 150-lbf/sq. ft. (7.18-kPa) cohesive and adhesive strength based on field testing according to ASTM E 736.
 - 3. Density: Not less than 15 lb/cu. ft. (240 kg/cu. m) and as specified in the approved fire-resistance design, according to ASTM E 605.

4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch (9 mm).
5. Combustion Characteristics: ASTM E 136.
6. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 10 or less.
 - b. Smoke-Developed Index: 0 or less.
7. Compressive Strength: Minimum 5.21 lbf/sq. in. according to ASTM E 761.
8. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
9. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
10. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
11. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours according to ASTM E 859.
12. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:
 1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.
- C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.
- D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.
- E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.
- G. Sealer: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by fireproofing manufacturer for each fire-resistance design.

- H. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:
 - 1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 - 2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.
- 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. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
- E. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- F. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- H. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.
- I. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- J. Cure fireproofing according to fireproofing manufacturer's written recommendations.
- K. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- L. Finishes: Where indicated, apply fireproofing to produce the following finishes:
 - 1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by the IBC, 1704.10.
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 078100

SECTION 078413 - PENETRATION FIRESTOPPING

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. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in smoke barriers.
- B. Related Sections:
 - 1. Section 078446 "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
- B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

- a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
- b. Classification markings on penetration firestopping correspond to designations listed by the following:

1) UL in its "Fire Resistance Directory."

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.
- C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. 3M Fire Protection Products.
 2. A/D Fire Protection Systems Inc.
 3. Grace Construction Products; W.R. Grace & Co. -- Conn.
 4. Hilti, Inc; CFS-DID.
 5. Johns Manville; a Berkshire Hathaway company.
 6. Nelson Firestop; a brand of Emerson Industrial Automation.
 7. Passive Fire Protection Partners.
 8. RectorSeal.
 9. Tremco, Inc.
 10. United States Gypsum Company.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
- D. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-wool-fiber or rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 - 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

- G. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- H. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, 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: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove

damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Firestopping with No Penetrating Items:
 - 1. UL-Classified Systems: C-AJ- 0001-0999.
- C. Firestopping for Metallic Pipes, Conduit, or Tubing:
 - 1. UL-Classified Systems: C-BK- 1001-1999.
- D. Firestopping for Nonmetallic Pipe, Conduit, or Tubing:
 - 1. UL-Classified Systems: C-BK- 2001-2999.
- E. Firestopping for Electrical Cables:
 - 1. UL-Classified Systems: C-BK- 3001-3999.
- F. Firestopping for Cable Trays with Electric Cables:
 - 1. UL-Classified Systems: W-K- 4001-4999.
- G. Firestopping for Insulated Pipes:
 - 1. UL-Classified Systems: C-BK- 5001-5999.
- H. Firestopping for Miscellaneous Electrical Penetrants:
 - 1. UL-Classified Systems: C-AJ- 6001-6999.
- I. Firestopping for Miscellaneous Mechanical Penetrants:
 - 1. UL-Classified Systems: C-AJ- 7001-7999.
- J. Firestopping for Groupings of Penetrants:
 - 1. UL-Classified Systems: C-AJ- 8001-8999.

END OF SECTION 078413

SECTION 078446 - FIRE-RESISTIVE JOINT 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. Joints in or between fire-resistance-rated constructions.
- B. Related Sections:
 - 1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."
- B. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:

1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
 - a. Fire-resistive joint system products bear classification marking of qualified testing agency.
 - b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:
 1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies, and roofs or roof/ceiling assemblies.
 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. A/D Fire Protection Systems Inc.
 - b. CEMCO.
 - c. Fire Trak Corp.
 - d. Grace Construction Products.
 - e. Hilti, Inc.
 - f. Johns Manville.
 - g. Nelson Firestop Products.
 - h. NUCO Inc.
 - i. Passive Fire Protection Partners.
 - j. RectorSeal Corporation.
 - k. Specified Technologies Inc.
 - l. 3M Fire Protection Products.
 - m. Tremco, Inc.; Tremco Fire Protection Systems Group.
 - n. USG Corporation.
- C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide fire-resistive joint systems with rating determined by ASTM E 119 based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa) or ASTM E 2307.
 - 1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A/D Fire Protection Systems Inc.
 - b. Grace Construction Products.
 - c. Hilti, Inc.
 - d. Johns Manville.
 - e. Nelson Firestop Products.
 - f. NUCO Inc.
 - g. Passive Fire Protection Partners.
 - h. RectorSeal Corporation.
 - i. Specified Technologies Inc.
 - j. 3M Fire Protection Products.
 - k. Thermafiber, Inc.
 - l. Tremco, Inc.; Tremco Fire Protection Systems Group.
 - m. USG Corporation.
- D. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, 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: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or

self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.6 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN.
- B. Floor-to-Floor, Fire-Resistive Joint Systems:
 1. UL-Classified Systems: FF-D-. 0000-0999.
- C. Floor-to-Wall, Fire-Resistive Joint Systems:
 1. UL-Classified Systems: FW-D-. 0000-0999.
- D. Head-of-Wall, Fire-Resistive Joint Systems:
 1. UL-Classified Systems: HW-D-. 0000-0999.
- E. Bottom-of-Wall, Fire-Resistive Joint Systems:
 1. UL-Classified Systems: BW-S-. 0000-0999.

END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Nonstaining silicone joint sealants.
 - 2. Urethane joint sealants.
 - 3. Latex joint sealants.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
 - a. Include test results performed on joint sealants after they have cured for 1 year.

- C. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single source manufacturer for each different product required.

1.6 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 NONSTAINING SILICONE JOINT SEALANTS

- A. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Sika Corporation
 - b. Sonneborn Building Products Division ChemRex, Inc.
 - c. Tremco, Inc.
 - d. W.R. Meadows, Inc.

2.3 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Sika Corporation
 - b. Sonneborn Building Products Division ChemRex, Inc.
 - c. Tremco, Inc.

- d. W.R. Meadows, Inc.

2.4 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corp.
 - b. Protective Treatments, Inc.
 - c. Tremco, Inc.

2.5 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - 3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Glass.
 - b. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
 - 4. Provide flush joint profile at where indicated according to Figure 8B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at where indicated according to Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Isolation and contraction joints in cast-in-place concrete slabs.
 - 2. Joint Sealant: Urethane, M, P, 50, T, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Control and expansion joints in unit masonry.
 - b. Perimeter joints between materials listed above and frames of doors, windows, and louvers.

- c. Other joints as indicated on Drawings.
- 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - 2. Joint Sealant: Urethane, S, P, 25, T, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Vertical joints on exposed surfaces of unit masonry.
 - 2. Joint Sealant: Urethane, S, NS, 25, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
 - 1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Acrylic latex.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 079219 - ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes acoustical joint sealants.
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.3 ACTION SUBMITTALS

- A. Product Data: For each acoustical joint sealant.

1.4 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.

2.2 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. GE Construction Sealants; Momenive Performance Materials Inc; RCS20 Acoustical.
 - b. OSI Sealants; Henkel Corporation; OSI Pro-Series SC-175 Acoustical Sound Sealant.
 - c. Pecora Corporation; AC-20 FTR.

d. United States Gypsum Company; SHEETROCK Acoustical Sealant.

2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

2.3 MISCELLANEOUS MATERIALS

- A. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.
- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or

deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079219

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes hollow-metal work.
- B. Related Requirements:
 - 1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.
 - 9. Details of conduit and preparations for power, signal, and control systems.
- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-(102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Amweld International, LLC.
 - 2. Ceco Door; ASSA ABLOY.
 - 3. Curries Company; ASSA ABLOY.
 - 4. Deansteel Manufacturing Company, Inc.
 - 5. Fleming Door Products Ltd.; Assa Abloy Group Company.
 - 6. Mesker Door Inc.
 - 7. Republic Doors and Frames.
 - 8. Steelcraft; an Allegion brand.
 - 9. Metal Products, Inc., Corbin, Kentucky
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2...

1. Physical Performance: Level B according to SDI A250.4.
2. Doors:
 - a. Type: All interior hollow metal doors and frames listed in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (1.0 mm).
 - d. Edge Construction: Model 1, Full Flush.
 - e. Core: Kraft-paper honeycomb.
 - f. Fire-Rated Construction: Each door assembly in a fire rated construction needs to be properly labeled per NFPA requirements.
3. Frames:
 - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
 - b. Non-Fire Rated Construction: Knocked down.
 - c. Fire-Rated Construction: Fully Welded Type.
 - 1) Fire Rating: Same as door, labeled.
4. Exposed Finish: Prime.
5. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy coated (galvannealed), manufacturer's standard coating thickness.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3...
1. Physical Performance: Level A according to SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm.)
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core: Polystyrene.
 - 1) Thermal-Rated Doors: Provide doors fabricated with U-Value of not less than 0.50 when tested according to ASTM C 1363.
 3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
 - b. Construction: Full profile welded.

4. Exposed Finish: Prime.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-(9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

- I. Glazing: Comply with requirements in Section 088000 "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Fire Door Cores: As required to provide fire-protection ratings indicated.
 - 2. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
 - 3. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
 - 4. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
 - 5. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 6. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:
 - 1) Two anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

- b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
 - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
 - D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
 - E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
 - F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of hollow-metal work.
 - 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.9 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - f. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.

4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
 6. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
 - b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
 - c. At Bottom of Door: 5/8 inch (15.8 mm) plus or minus 1/32 inch (0.8 mm).
 - d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Requirements:
 - 1. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
 - 1. Dimensions and locations of blocking.
 - 2. Dimensions and locations of mortises and holes for hardware.
 - 3. Dimensions and locations of cutouts.
 - 4. Undercuts.
 - 5. Requirements for veneer matching.
 - 6. Doors to be factory finished and finish requirements.
 - 7. Fire-protection ratings for fire-rated doors.
- C. Samples for Initial Selection: For factory-finished doors.
- D. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during remainder of construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Algoma Hardwoods, Inc.
 - 2. Eggers Industries.
 - 3. Graham Wood Doors; ASSA ABLOY Group company.
 - 4. Lambton Doors.
 - 5. Marshfield DoorSystems, Inc; Wood Veneered Doors.
 - 6. Mohawk Flush Doors, Inc.
 - 7. Oshkosh Door Company.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."
- B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 - 2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 - 3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- D. Particleboard-Core Doors:
 - 1. Particleboard: ANSI A208.1, Grade LD-2.
 - 2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
 - a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
 - b. 5-inch (125-mm) bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
 - c. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
 - d. The requirements above are minimums. Coordinate with door hardware to provide appropriately sized blocking.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors.:
 - 1. Grade: Premium, with Grade A faces.
 - 2. Species: Red oak.
 - 3. Cut: Plain sliced (flat sliced).
 - 4. Match between Veneer Leaves: Pleasing match.
 - 5. Assembly of Veneer Leaves on Door Faces: Running match.
 - 6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 - 7. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 20 feet (6 m) or more.
 - 8. Exposed Vertical and Top Edges: Same species as faces or a compatible species - edge Type A.
 - 9. Core: Particleboard.
 - 10. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
 - 11. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 LIGHT FRAMES AND LOUVERS

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
 - 1. Wood Species: Species compatible with door faces.
 - 2. Profile: Flush rectangular beads.

3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.
- B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 1. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Openings: Factory cut and trim openings through doors.
 1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Transparent Finish:
 1. Grade: Premium.
 2. Finish: WDMA TR-6 catalyzed polyurethane.
 3. Staining: As selected by Architect from manufacturer's full range.
 4. Sheen: Semigloss.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 084113 - ALUMINUM-FRAMED STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior and interior storefront framing.
 - 2. Storefront framing for window walls.
 - 3. Storefront framing for punched openings.

1.3 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - 2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 - 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- C. Samples for Initial Selection: For units with factory-applied color finishes.

- D. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- B. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 MOCKUPS

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than

- 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm).
 - a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
 3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans less than 11 feet 8-1/4 inches (3.6 m).
- E. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
- H. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K) as determined according to NFRC 100.
 2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
 3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than frame 47, glass 48 as determined according to NFRC 500.
- I. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.
1. Outdoor-Indoor Transmission Class: Minimum 30.

- J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
 - b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
 - c. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

2.2 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer "EnCore Framing System- 4-1/2 inch deep with 1 3/4" sightline," depth as indicated in drawings or as required by manufacturer to achieve heights of framing indicated without additional cost. Comparable product by one of the following:
1. EFCO Corporation.
 2. Kawneer North America; an Alcoa company.
 3. TRACO.
 4. Trulite Glass & Aluminum Solutions, LLC.
 5. Tubelite Inc.
 6. Vistawall International
- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing venting windows and accessories, from single manufacturer.

2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally broken.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Front.
 4. Fabrication Method: Field-fabricated stick system.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Materials:
1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209 (ASTM B 209M).

- b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
- 2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
 - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
- E. Extruded Aluminum Subsill: manufacturer's extruded aluminum sill, sloped for positive wash, to fit under sash leg. One piece full width of opening jamb, angles to terminate at sill end. Sill to be minimum a .125 inch thick and sloped for positive wash

2.4 VENTING WINDOWS

- A. Aluminum Windows: Manufacturer's standard units, complying with AAMA/WDMA/CSA 101/I.S.2/A440, with self-flashing mounting fins, and as follows:
 - 1. Window Type: Awning.
 - 2. Minimum Performance Class: AW.
 - 3. Minimum Performance Grade: 45.
 - 4. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 0.064-inch (1.63-mm) thickness at any location for main frame and sash members.
 - a. Thermally Improved Construction: Fabricate window units with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
 - 5. Fasteners, Anchors, and Clips: Nonmagnetic stainless steel, aluminum, or other noncorrosive material, compatible with aluminum window members, trim, hardware, anchors, and other components of window units. Fasteners shall not be exposed, except for attaching hardware.
 - a. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.128 inch (3.26 mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, spline grommet nuts.
 - 6. Hardware: Manufacturer's standard; of aluminum, stainless steel, die-cast steel, malleable iron, or bronze; including the following:
 - a. White Bronze cam-action sweep sash lock and keeper with three (3) cam lock tools for maintenance staff operation.
 - b. Spring-loaded, snap-type lock at jambs.
 - c. Pole-operated, cam-action locking device on meeting rail where rail is more than 72 inches (1830 mm) above floor.

- d. Stainless steel 4 bar hinges to be included, with limiting hardware to adjust the opening size.
- B. Glazing: Refer to Section 088000- Glazing.
- C. Finish: As selected by Architect from manufacturer's full range of colors.

2.5 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Comply with Section 088000 "Glazing."
- C. Glazing Sealants: Comply with Section 088000 "Glazing."
- D. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
 - 1. Color: Match structural sealant.

2.6 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- F. Storefront Framing: Fabricate components for assembly using head-and-sill-receptor system with shear blocks at intermediate horizontal members.
- G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 1. Color and Gloss: As selected from Architect from manufacturer's full range of colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

- A. General:
 1. Comply with manufacturer's written instructions.
 2. Do not install damaged components.
 3. Fit joints to produce hairline joints free of burrs and distortion.
 4. Rigidly secure nonmovement joints.

5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 088000 "Glazing."

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
 - c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

END OF SECTION 084113

SCHOOL RENOVATION AND ADDITION
PAYNEVILLE, KENTUCKY

SECTION 087100 – DOOR HARDWARE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes furnishing items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

- 1. Butt Hinges
- 2. Continuous Hinges
- 3. Cylinders
- 4. Flushbolts and Strikes
- 5. Locks and Latches
- 6. Closers
- 7. Push and Pull Plates
- 8. Protection Plates
- 9. Door Stops
- 10. Thresholds, Weatherstripping, Gasketing, Auto. Door Bottoms.
- 11. Magnetic Holders
- 12. Silencers

- B. Related Sections: The following Sections contain requirements that relate to this Section:

- 1. Division 1 ORGANIZATIONS & SERVICES
 - a. Section 01300 Administrative Requirements
 - b. Section 01400: Quality Requirements
 - c. Section 01500 Temporary Facilities and Controls
- 2. Division 3 CONCRETE
 - a. Section 03400 Precast Concrete, installation of door frames.
- 3. Division 4 MASONRY
 - a. Section 04400 Concrete Masonry Units, installation of door frames.
- 4. Division 6 WOOD & PLASTICS
 - a. Section 06100 Rough Carpentry, blocking for finish hardware.
 - b. Section 06400 Architectural Woodwork, installation of doors and finish hardware.
- 5. Division 7 THERMAL & MOISTURE PROTECTION
 - a. Section 07900 Caulks and Sealants.
- 6. Division 8 DOORS and WINDOWS

SCHOOL RENOVATION AND ADDITION
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|----|---------------|----------------------------------------|
| a. | Section 08110 | Standard Hollow Metal Doors and Frames |
| b. | Section 08210 | Flush Wood Doors. |
| | | |
| 7. | Division 9 | FINISHES |
| a. | Section 09900 | Paintings and Coatings |

1.03 REFERENCES

- A. Applicable publications: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. American National Standards Institute (ANSI)
1. ANSI A117.1-1998, Providing Accessibility and Usability for Physically Handicapped People
 2. ANSI/BHMA A156.1-1997, Butts and Hinges
 3. ANSI/BHMA A156.4-1992, Door Controls-Closers
 4. ANSI/BHMA A156.6-2001, Architectural Door Trim
 5. ANSI/BHMA A156.7-1997, Template Hinge Dimensions
 6. ANSI/BHMA A156.13-1994, Locks & Latches, Mortise
 7. ANSI/BHMA A156.18-1993, Materials and Finishes
 8. ANSI/BHMA A156.21-1996, Thresholds
 9. ANSI/BHMA A156.22-1996, Door Gasketing Systems
- C. American Society for Testing and Materials (ASTM)
1. ASTM E 283-84 Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors
 2. ASTM-E2074-2001 Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies
- D. Americans with Disabilities Act Accessibility Guidelines(ADAAG)
1. ICC/ANSI A117.1, JULY 1998
- E. Door and Hardware Institute (DHI)
1. Keying Systems and Nomenclature, 1989 edition.
 2. Hardware for Labeled Fire Doors, January 1996 edition.
 3. Sequence and Format for the Hardware Schedule, January 1996 edition.
 4. Abbreviations and Symbols, September 1983 edition.
- F. National Fire Protection Association (NFPA)
1. NFPA 80 Standard for Fire Doors and Windows, 1999 edition.
 2. NFPA 101 Life Safety Code, 2003 edition.
 3. NFPA 105 Recommended Practice for the Installation of Smoke-Control Door Assemblies, 1999 edition.

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4. NFPA 252 Standard Methods of Fire Tests of Door Assemblies, 1995 edition.

- G. Steel Door Institute (SDI)
1. SDI 100 Recommended Specifications for Standard Steel Doors and Frames, 1998 edition.
- H. Underwriter's Laboratories, Inc. (UL) - UL Standards for Safety:
1. UL 10C-Positive Pressure Fire Tests of Door Assemblies
2. UL 228 Door Closer-Holders, With or Without Integral Smoke Detectors
3. UL 1784-90 Air Leakage Tests of Door Assemblies

1.04 SUBMITTALS

- A. General: Each requirement listed under headings below shall be submitted in relation to all items specified in this section. The submittal for each heading shall be compiled by the Contractor and submitted complete and in its entirety.
- B. Shop Drawings: Submit binder with label on the front cover and spine indicating job name, date, Contractor's name and the title "DOOR HARDWARE". Binder shall contain all of the door hardware shop drawings with largest sheets 11" x 17" (279 x 432 mm). Punch and fold largest sheets to fit in binder. Separate items in binder with tabbed reinforced index sheets indicating contents in each section. Use door references same as contract documents. Highlight items on shop drawings in question with yellow marker for Architect's review and response. Submit complete hardware schedule, catalog cut sheets, templates, and specifications for all hardware set items.
1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule in vertical format "hardware sets" indicating complete designations of every item required for each door or opening. Hardware schedule to be in the DHI vertical format as per DHI publication Sequence and Format for the Hardware Schedule. Use specification Heading numbers with any variations suffixed a, b, etc. Include the following information:
- Type, style, function, size, hand, and finish of each hardware item.
 - Name and manufacturer of each item.
 - Fastenings and other pertinent information.
 - Location of each hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
 - Index and explanation of all abbreviations, symbols, and codes contained in schedule.
 - Mounting locations for hardware.
 - Door and frame sizes and materials.
 - Keying information.
 - Cross-reference numbers used within schedule deviating from those specified.
 - Column 1: State specified item and manufacturer.
 - Column 2: State prior approved substituted item and its manufacturer.

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2. Production and Delivery Schedule: Submit a production and delivery schedule as well as all templates to be forwarded to other trades involved in hardware preparation work.
3. Templates: Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
4. Operations and Maintenance Data: The manufacturer shall furnish the owner a OPERATIONS AND MAINTENANCE MANUAL. Information shall be bound in a 3-ring loose-leaf binder with project name and address on the front cover and spine. Submit in accordance with Section 01770 Closeout Procedures. In this manual are to be one copy of each of the following:
 - a. Name, address, phone and fax for the Finish Hardware supplier.
 - b. Name, address, phone and fax number for the local manufacturers representative for each manufacturers who's products have been used on this project.
 - c. Specification Section 08710 Finish Hardware.
 - d. "AS BUILT" Door and Frame Schedule.
 - e. "AS BUILT" Finish Hardware schedule.
 - f. "AS BUILT" Keying Schedule.
 - g. Hardware manufacturers maintenance instructions, if any.
 - h. Fully executed Warranty(s) for finish hardware.
 - i. Specifications for related sections.
5. Abbreviations: Use abbreviations per DHI publication Abbreviations and Symbols.
6. Keying Schedule: Keying schedule is to be formatted as per DHI publication Keying Systems and Nomenclature. Supplier shall submit a keying schedule after meeting with Owner and Architect as specified.

1.05 QUALITY ASSURANCE

- A. Manufacturers Requirements: Repair or replace damaged or defective materials prior to shipment. If product is repaired it is to meet all QA requirements for said product.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with office and warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC), or a person with equivalent experience, who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation. Supplier to be a regular authorized distributor of the products he or she intends to furnish. Supplier to meet with Owner to

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finalize keying requirements and to obtain final instructions in writing. Supplier to meet with installer prior to beginning of installation of door hardware to answer any questions concerning installation.

- C. Regulatory Requirements: Comply with requirements of NFPA 80, NFPA101 and NFPA 252 in providing hardware for fire rated openings.

- D. Product Standards:
 - 1. Hinges, Mortise Locks and Latches, Closers, Thresholds, Trim, Finishes and other miscellaneous hardware: Complying with requirements of ANSI A156 standards for quality, construction, performance and operation applicable for specified hardware.

- E. **Substitutions: Submit requests for substitution no less than ten days prior to bid date and accordance with the requirements set fourth in Division 1.**

- F. Pre-Installation Conference: Require attendance for the GC project manager & superintendent, material supplier, installer, and manufacturer's representative. Notify all participants of the meeting at least one week before the meeting. No hardware is to be installed prior to this meeting. Installer shall not proceed with installation, until installer has performed the correct and satisfactory installation of an exit device, closer, and mortise lockset. All parties shall agree before proceeding.

- G. Keying Meeting: The supplier will be responsible for scheduling, coordinating and documenting a keying meeting to establish requirements for the project.

1.06 DELIVERY AND STORAGE

- A. Tag each item or package according to the approved finish hardware schedule, and include manufacturers installation instructions with each item or package.
- B. Deliver hardware in manufacturers original packaging.
- C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- D. Deliver individually packaged door hardware items to the jobsite according to the progress of construction. No drop shipments will be accepted.
- E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

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- F. Store Finish Hardware per manufacturers recommendations.

1.07 WARRANTY

- A. Warranty to comply with requirements set fourth in Division 1. Warranty to commence at date of acceptance. Furnish manufacturers' limited warranty covering defects in materials and workmanship for the minimum periods indicated below:

Continuous Hinges: Lifetime
Door Closers: Minimum Ten years
Locksets: Minimum Ten years
Exit Devices: Minimum Ten years
All other hardware: Minimum One year

1.08 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware. These tools are limited to tools that are manufactured by the hardware manufacturers for the products used on this project .ie spanner wrenches, closer adjustment tools.
- B. Extra Materials: The following is a list of parts and materials that shall be furnished:
1. Furnish 2 screw packages, or fasteners, for each hardware item.
 2. Furnish 20 keys cut at the owner's requests.
 3. Furnish 2 storeroom function mortise locks.
 4. Furnish 2 spring stop closers with cover, arm, and fasteners.
 5. Furnish 1 rim exit device with lockable lever trim.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers listed have products specified in this section. Only the manufacturers' products specifically listed are acceptable, subject to meeting or exceeding the requirements specified.
- B. Acceptable manufacturers listed as follows are referred to in this section hereinafter by their first or common trade names:
1. **Bommer Industries**
 2. **Best**
 3. **Dorma**
 4. Hager
 5. LCN
 6. McKinney

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7. National Guard Products, Inc.
 8. Norton
 9. PBB
 10. **Pemko Mfg. Co.**
 11. Precision
 12. **Reese Enterprises, Inc.**
 13. Rockwood Mfg. Co.
 14. Sargent Mfg. Corp.
 15. Schlage
 16. **Trimco**
 17. Von Duprin

Note: Hardware sets written in bolded manufacturers.

2.02 HINGES

A. Full Mortise Butt Hinges:

Provide templated hinges. Furnish flathead screws with each hinge. Finish screw heads to match surface of hinges. Provide steel threaded, to the head, wood screws. Provide out-swing exterior doors with non-removable pins. Out-Swing Corridor Doors with locks with non-removable pins, and interior door with non-rising pins. All hinges to have flat button and matching plug. Size hinges in accordance with specified manufacturer's published recommendations. Furnish one pair of hinges for all doors up to 5'0" high. Furnish one hinge for each additional 2-1/2 feet or fraction thereof. Furnish heavy weight hinges for doors over 3'-4", or doors that are frequently used such as: locker rooms, rest rooms, vestibule, and the main office door. Furnish non-ferrous hinges on exterior doors, doors in wet areas, and in areas where doors that are exposed to heavy corrosion. Furnish stainless steel spring hinges on toilet compartment doors, in conjunction, with a three knuckle stainless steel standard weight hinge where specified.

1. Acceptable manufacturers and products:
 - a. Steel Five Knuckle Full Mortise Butt Hinges:

MFG.	STD.WT.	HEAVY WT.	SPRING HNG.
MCKINNEY	TA2714	T4A3786	1552
Hager	BB1279	BB1168	1250
Bommer	BB5000	BB5004	LB4310
PBB	BB81	4B81	SP81

2.03 CONTINUOUS HINGES

A. Geared Aluminum Continuous Hinges:

1. Full Mortise: Provide heavy duty geared aluminum continuous hinges. Continuous hinges to be manufactured from 6063-T6. Hinges will comply with ANSI/BHMA Standard A156.26-2000. Hinges will be certified Grade 1-300, and cycle for a minimum of 1.5 million cycles without

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failure. Anodizing to be applied after gearing the hinge. Hinges will be non-handed. Hinges to carry a lifetime warranty.

2. Acceptable products and manufacturers:

<u>Manufacturer</u>	<u>Product</u>
Bommer	FM83SLFHD, FM83SLIHD
McKinney	MCK-12HD, MCK-14HD
Pemko	FM83SLFHD, FM83SLIHD
PBB	CG31

2.04 KEY CYLINDERS AND KEYING

- A. Key Cylinders: Provide six-pin removable core cylinders meeting ANSI Grade 1 Security. Furnish the cylinders with a patent keyway. Supply manufacturer's standard size cylinder as required to accommodate specified hardware. Include security cylinder rings, extensions and collars as required to accommodate installation. Provide factory original keys of nickel silver. Provide only one outside cylinder at banks of doors.
- B. Acceptable manufacturers and products:
BEST, no substitution.
- C. Keying:
1. Key Systems: Furnish a grand master key system for this project to tie into the owners existing system.
 2. Key Quantities: Provide number of keys indicated. Quantities indicated shall be used as the basis for adjustments, if required, after keying is established with Owner.
 - a. Provide 3 each Change Keys per lock.
 - b. Provide 4 each Master Keys
 - c. Provide 4 each Grand Master Keys
 3. Key Control: Hardware manufacturer shall produce pinning chart. All keys shall be accounted for at all times and delivered to the designated personnel as directed by Owner. Index, tag and deliver keys in sealed containers; shipped direct to Owner by prepaid registered mail or other secure method acceptable to Owner. All keys assigned to Contractor shall be surrendered to Owner upon completion of the project. The Owner will provide a receipt for all keys received. If at any time a key cannot be accounted for, the lock cylinder shall be re-keyed, or the entire lock replaced if re-keying is not possible, at no additional cost to the Owner.
 4. Key Identification: Each key shall be stamped or engraved with the key set per the approved key schedule in addition to the manufacturer's standard markings.

2.05 MORTISE LOCK AND LATCH SETS:

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- A. Mortise Locks and Latches: Provide mortise sets that conform to ANSI/BHMA A156.13-1994, Locks & Latches, Mortise. Mortise locksets to be Operational Grade 1 Series 1000. Lockset functions to be manufactured in a single sized case formed from 12 gauge steel. The case shall be closed on all sides. The lockset shall have a backset of 2-3/4" and a one piece 3/4" throw anti-friction stainless steel latchbolt. Where deadbolts are specified within the mortise lock; the deadbolts shall have a full 1" throw made of stainless steel and have two hardened steel roller inserts. Furnish knurled outside levers for all mechanical and electrical rooms. Furnish a Grade 1 extra-heavy duty cylindrical privacy on toilet compartment doors as specified. Furnish a keyless, battery powered, stand alone, pushbutton lockset on the Records Room.

- B. Acceptable manufacturers and product series:

<u>Manufacturer</u>	<u>Lock Series</u>	<u>Cylindrical</u>	<u>Pushbutton Lock</u>
Schlage	L9000-03A	D Series	Cobra
Sargent	8200-LNJ	CL800 Series	KP8277
Best	45H-3H	93K Series	

2.06 EXIT DEVICES/TRIM/AND MULLIONS

- A. Provide exit devices with "UL" listing for life safety and with "UL" labels for "Fire Exit Hardware" unless noted otherwise. At any non-rated applications indicated, provide key cylinder control of latch dogging. All exit devices mounted on labeled wood doors shall be mounted on the door per the door manufacturer's requirements. All trim shall be thru-bolted to the lock stile case. Provide glass bead conversion kits to shim exit devices on doors with raised glass beads as required. All exit devices shall be one manufacturer. No deviation will be considered. Lever trim shall be solid case material with a free wheeling feature to limit damage to the unit from vandalism. Hardware to comply with ANSI A156.3, Grade 1 requirements. Mount all exit devices at 40" centerline. Furnish key removable mullions with stabilizer kits on pairs of doors where specified. Furnish steel mullions on fire-rated openings where specified.

- B. Acceptable manufacturers and products:

<u>MFG.</u>	<u>LEVER TRIM</u>	<u>MULLIONS</u>
Sargent 80 Series	ETJ	L980/L980A
Precision 2100 Series	49C	KR822
Dorma 9000 Series	LT	F1300KR
Von Duprin	03	KR4954

2.07 DOOR CLOSERS

- A. Door closers shall have fully hydraulic, full rack and pinion action. Closers shall be one piece cast aluminum. Furnish a universal closer body where all arms are interchangeable with the same body. All closers shall utilize a stable all weather fluid without seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors shall be provided with temperature stabilizing

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fluid that complies with standards UBC 7-2 (1997) and UL 10C, as required. Closers shall be multi sized 1 thru 6, and non-handed. Provide full closer cover. Stake or captivate all closer adjustment valves. Closers to be installed to allow door swing as shown on plans. Doors swinging into exit corridors shall provide for corridor clear width as required by code. Where possible, mount closers inside rooms. Provide closer variants conforming to ADA ANSI-A117.1. Furnish the necessary brackets and spacers for the correct operation of the closer rather specified or not. Furnish heavy duty thumb turn hold open arms at vestibule locations.

B. Acceptable manufacturers and products:

<u>Manufacturer</u>	<u>Heavy Duty</u>
Norton	UNI7500 Series
Dorma	8900 Series
LCN	4040 Series
Sargent	351 Series

2.08 DOOR BOLTS/DUST PROOF STRIKES/COORDINATORS

- A. Furnish 12" manual top and bottom flushbolts for non-rated doors. Furnish automatic flushbolts for fire-rated doors.
- B. Furnish a dust proof strike for the bottom flushbolt where specified in the hardware sets.
- C. Furnish a door coordinator with automatic flushbolts; allowing the inactive leaf door to close before the active leaf. Furnish the correct size according to the width of the opening. Use filler plates where needed. Furnish special mounting brackets for stop mounted hardware.

Acceptable manufacturers and products:

<u>Manufacturer</u>	<u>Manual Flushbolts</u>	<u>Dust Proof Strike</u>	<u>Automatic Flushbolts</u>	<u>Coordin.</u>
Rockwood	555	570	1942	1672
Trimco	3917	3910	3815	3094B2

2.09 PUSH PLATES, PULLS AND PULL PLATES

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- A. Pulls: Material to be 1" solid stainless steel. Pulls to be 10" Center to Center. Provide spanner type thru-bolt back to back fasteners at common ends and button tip spanner thru-bolts at free ends.
- B. Furnish 6 X 16 push plates wherever possible, except when the stile on the door will not allow you to do so. In these cases, furnish 4 X 16 push plates.
- C. Furnish 4 X 16 pull plates where specified in the hardware sets.
- D. Plates to be furnished with .050 thick. Furnish back to back mounting wherever possible, and metal screws for metal doors and wood screws for wood doors. Plates shall be CuVerro anti-microbial base metal. Coatings are unacceptable.

- E. Acceptable manufacturers and products:

<u>Manufacturer</u>	<u>Push Plates</u>	<u>Pulls</u>
Trimco	1001-9	1018-3B

2.10 PROTECTIVE PLATES

Protective plates to be .050" thick (U.S. 18 gage) stainless steel. Counter sink for mechanical fasteners. Fasten with pan head oval stainless steel sheet metal screws provided by protective plate manufacturer. Bevel all four sides.

- A. Kick Plates: Kick plates are to be mounted on push side of door and to be 8" in height and 2" LDW, unless otherwise specified. Where the bottom rail will not allow for the full 8" in height, furnish the maximum height that will protect the bottom rail.
- B. Acceptable manufacturers and products:

<u>Manufacturer</u>	<u>Kick Plate</u>
Rockwood	K1050
Trimco	K0050

2.11 WALL STOPS

- A. Wall Stops: Provide convex wall stops with concealed combo pack fasteners. Use toggle fasteners in drywall and machine screws and rawl plugs in masonry and concrete walls.
- B. Acceptable manufacturers and products:

<u>Manufacturer</u>	<u>Wall</u>	<u>Wall/Holder</u>
Trimco	1278CX	1283-6S

2.12 DOOR SEALS/GASKETING/THRESHOLDS/AUTO.DOOR BOTTOMS

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Aluminum extrusions to be T-6063 or T-6463 with a minimum hardness of T-5. Provide mechanical fasteners. Use only manufacturer supplied fasteners.

- A. Door Seals and Gasketing:
Fasteners shall be stainless steel sheet metal screws. Furnish UL listed gasketing for all fire-rated doors.
1. Perimeter Seals:
Provide bulb seal at head and jambs. Seal to be polyurethane. Fasten with manufacturer's recommended and supplied fasteners.
 2. Thresholds & Automatic Door Bottoms:
Furnish thresholds 4" longer than the door width. Provide only manufacturer supplied fasteners. Secure thresholds with stainless steel wood screws and plastic anchors. Secure automatic door bottoms with stainless steel sheet metal screws.
 - a. Thresholds: Provide .125" thick material for ¼" rise saddle thresholds and .200" material for ½" rise saddle thresholds.
 - b. Furnish thresholds with anti-slip surface similar to "PemKote"
 - c. Acceptable manufacturers and products:

Manufacturer	Weatherstrip	½" Rise x ADA Panic	½" Rise Saddle	Gasket	Auto.Door Bottoms
NGP	162S	896S	425SIA	5050	335N
Pemko	297AS	2005AT	171AK	S88D	411ARL
Reese	762A	S483AU	S425A	797B	370A

2.13 SILENCERS

- A. Provide punch in silencers. Manufactured of rubber, neoprene or silicone types of pneumatic design for mounting to metal door frames. Silencers to meet the requirements of ANSI A156.16.
- B. Acceptable manufacturers and products:

<u>Manufacturer</u>	<u>Open Section Frame</u>	<u>Closed Section Frame</u>
Rockwood	608	608
Trimco	1229A	1229A

- C. Provide three for each single doors; two for pairs of doors.

2.14 KEY CABINET

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- A. Key cabinet to have hinged panel and be a wall mount type unit. Key cabinet to have a two tag type system with a key loan register for the tracking of signed out keys. Furnish a mortise cylinder for the key cabinet.

Acceptable manufacturers and products:

<u>Manufacturer</u>	<u>Product</u>
MMF	201846003
Tel-Kee	AWC-450-S

2.15 MATERIALS AND FABRICATION

- A. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.
- B. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
1. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
 2. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
 3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners.
 4. Do not use thru-bolts or sex bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of adequately fastening the hardware, or otherwise found in Headings. Coordinate with wood doors and metal doors and frames where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.16 HARDWARE FINISHES

- A. Match items to the manufacturer's standard color and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets). **Match existing finishes.**
- B. Provide finishes that match those established by ANSI or, if none established, match the Architect's sample.

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- C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- D. **Provide compatible finishes for the aluminum storefront doors and frames.**
- E. The designations used to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.
- | | | |
|----|------------------------------|------------------------------------|
| 1. | Continuous Hinges (Exterior) | Aluminum/match the door and frame. |
| 2. | Hinges (Interior) | 652 |
| 3. | Locks | 626 |
| 4. | Exit Devices | 630 |
| 5. | Door Closers | 689 |
| 6. | Protective Plates | 630 |
| 7. | Door Stops | 626/630 as specified |
| 8. | Thresholds/Weatherstripping | Mill Finish Aluminum |

PART 3 EXECUTION

3.01 INSTALLATION

- A. **USE ONLY MANUFACTURER SUPPLIED FASTENERS. USE OF ANY OTHER FASTENERS WILL VOID LABEL AND WARRANTY.**
- B. Install hardware per manufacturers instructions and in compliance with:
1. NFPA-80
 2. NFPA-101
 3. NFPA-105
 4. NFPA-252
 5. ANSI A117.1
 6. Local building code requirements
 7. Approved Shop Drawings
 8. Approved Finish Hardware Schedule
- C. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.
- D. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

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- E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealers".
- G. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.02 FIELD QUALITY CONTROL

Material supplier to inspect hardware after installation and before final acceptance in order to ensure that hardware has been properly installed. If there are any discrepancies the material supplier is to provide the Architect, General Contractor and Installer with a written report detailing any and all discrepancies. All discrepancies are to be corrected prior to final acceptance unless otherwise directed by the Owner.

3.03 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. Adjusting: Hardware installer to adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
 - 1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to function properly with final operation of heating and ventilating equipment.
- B. Cleaning: General Contractor to:
 - 1. Clean adjacent surfaces soiled by hardware installation.
 - 2. Clean finish hardware per manufacturers instructions after installer makes final adjustments and prior to final acceptance. Remove all mortar, dry wall mud, paint over spray and foreign materials from hardware. Replace at no cost to owner items that can not be cleaned to manufacturers level of finish quality.
- C. Demonstrating: Prior to final acceptance, the Door Hardware Supplier and Hardware Installer shall:
 - 1. Conduct a training class for the building maintenance personnel in the adjustment, operation and maintenance of mechanical and electrified finish hardware. At the start of this class the installer is to turn over all special tools for finish hardware, that were provided with hardware, by the hardware manufacturer, to the building maintenance supervisor.

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3.04 HARDWARE SCHEDULE

Hardware Set #1	E100,
1ea. Cont.Hinges	FMSLF83HD SER
1ea. Cont.Hinges	FMSLF83HD
1ea. Exit Device	CD9300B L V102
1ea. Exit Device	CD9300B L MLR V103
1ea. Rem.Mullion	1340KR
1ea. Mullion Seal	628
1ea. Power Supply	PS610RF
1ea. Card Reader	By Others
1ea. Remote Push Button	3909
4ea. Cylinders	1E74 X 1E72
2ea. Closer	8916 SDS
2ea. Blade Stop Spacers	BSHD
1ea. Threshold	S424A SRS

Note: Weatherstripping and door bottoms by door supplier.

OPERATION DESCRIPTION: DOORS ARE LOCKED AT ALL TIMES. INGRESS VIA AUTHORIZED CREDENTIAL, OR MECHANICAL KEY, OR REMOTE PUSH BUTTON AFTER IDENTITY IS CONFIRMED VIA INTERCOM. EGRESS AT ALL TIMES.

Hardware Set #2	E127B,E131,
2ea. Cont.Hinges	FMSLF83HD
2ea. Exit Device	LD9300B
1ea. Rem.Mullion	1340KR
1ea. Mullion Seal	628
1ea. Cylinders	1E74 X 1E72
2ea. Closer	8916 SDS
2ea. Blade Stop Spacers	BSHD
1ea. Threshold	S424A SRS

Note: Weatherstripping and door bottoms by door supplier.

Hardware Set #3	E144,E145,
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SCHOOL RENOVATION AND ADDITION
PAYNEVILLE, KENTUCKY

2ea. Cont.Hinges	FMSLF83HD
1ea. Exit Device	CD9300B V103
1ea. Exit Device	CD9300B V102
1ea. Rem.Mullion	1340KR
1ea. Mullion Seal	628
1ea. Cylinders	1E74 X 1E72
2ea. Closer	8916 SDS
2ea. Blade Stop Spacers	BSHD
1ea. Threshold	S424A SRS

Note: Weatherstripping and door bottoms by door supplier.

Hardware Set #4	E146,
1ea. Cont.Hinges	FMSLI83HD
1ea. Exit Device	CD9300B L V102
1ea. Exit Device	CD9300B L V103
1ea. Rem.Mullion	1340KR
1ea. Mullion Seal	5100N
4ea. Cylinders	1E74 X 1E72
2ea. Closer	8916 SDS TB
1ea. Threshold	S483U
1ea. Weatherstripping	769A
2ea. Door Bottom	772A

Hardware Set #5	E155,E117,E125,E127A,
1ea. Cont.Hinges	FMSLI83HD
1ea. Lockset	45H7D3H
1ea. Closer	8916 SDS
1ea. Kickplate	KO050
1ea. Latch Guard	5001
1ea. Door Bell	By Others
1ea. Threshold	S483U
1ea. Weatherstripping	769A
1ea. Door Bottom	772A

OPERATION DESCRIPTION: DOOR IS LOCKED AT ALL TIMES. INGRESS VIA MECHANICAL KEY, OR BY DOOR BELL, WHEREAS SOMEONE WILL MANUALLY OPEN THE DOOR. EGRESS AT ALL TIMES.

SCHOOL RENOVATION AND ADDITION
PAYNEVILLE, KENTUCKY

Hardware Set #6	E108,
1ea. Cont.Hinges	FMSLF83HD
1ea. Exit Device	CD9300B V103
2ea. Cylinders	1E74 X 1E72
1ea. Closer	8916 SDS
1ea. Blade Stop Spacers	BSHD
1ea. Threshold	S424A SRS

Note: Weatherstripping and door bottoms by door supplier.

Hardware Set #7	100,
1ea. Cont.Hinges	FMSLI83HD SER
1ea. Cont.Hinges	FMSLI83HD
1ea. Exit Device	CD9300B L V102
1ea. Exit Device	CD9300B L MLR V103
1ea. Rem.Mullion	1340KR
1ea. Mullion Seal	5100N
1ea. Power Transfer	ES105
1ea. Card Reader	By Others
1ea. Auto.Opeator	ED900J
4ea. Cylinders	1E74 X 1E72
1ea. Closer	8916 SDS
2ea. Kickplate	KO050
2ea. Silencers	1229A

OPERATION DESCRIPTION: DOORS ARE LOCKED AT ALL TIMES. INGRESS VIA AUTHORIZED CREDENTIAL, OR MECHANICAL KEY. EGRESS AT ALL TIMES.

Hardware Set #8	101A,101B,102A,102B,103A,103B,106A,106B
3ea. Hinges	BB5000 450
1ea. Lockset	45H7TA3H
1ea. Closer	8916 AF
1ea. Kickplate	KO050
1ea. Wall Stop	1278CXCP
3ea. Silencers	1229A

Hardware Set #9	104,107
3ea. Hinges	BB5000 450

SCHOOL RENOVATION AND ADDITION
PAYNEVILLE, KENTUCKY

1ea. Lockset	45H7D3H
1ea. Closer	8916 AF
1ea. Wall Stop/Holder	1283-6S
3ea. Silencers	1229A
Hardware Set #10	127A,131,
6ea. Hinges	BB5000 450
1ea. Lockset	45H7R3H
1ea. Flushbolts	3917 (Top only)
2ea. O.H.Stops	902H
2ea. Silencers	1229A
Hardware Set #11	112B,117,128,136A,
3ea. Hinges	BB5000 450
1ea. Lockset	45H7R3H
1ea. Wall Stop	1278CXCP
3ea. Silencers	1229A
Hardware Set #12	117A,116,129,152,
3ea. Hinges	BB5000 450
1ea. Privacy	45H0L3H
1ea. Wall Stop	1278CXCP
3ea. Silencers	1229A
Hardware Set #13	110,111,
3ea. Hinges	BB5000 450
1ea. Lockset	45H7R3H
1ea. Wall Stop	1278CXCP
1ea. Door Bottom	370A
1ea. Gasketing	797B
Hardware Set #14	108A,

SCHOOL RENOVATION AND ADDITION
PAYNEVILLE, KENTUCKY

3ea. Hinges	BB5000 450
1ea. Passage	45H0N3H
1ea. Wall Stop	1278CXCP
3ea. Silencers	1229A

Hardware Set #15 113,

3ea. Hinges	BB5000 450
1ea. Lockset	45H7D3H
1ea. Closer	8916 AF
1ea. Kickplate	KO050
1ea. Wall Stop/Holder	1283-6S
1ea. Gasketing	797B

Hardware Set #16 114,

3ea. Hinges	BB5000 450
1ea. Keypad Lockset	EPLEX E2031 LR 626 J
1ea. Cylinder	1E74
1ea. Closer	8916 AF
1ea. Kickplate	KO050
1ea. Wall Stop	1278CXCP
1ea. Gasketing	797B

Hardware Set #17 115,132B,144B,

3ea. Hinges	BB5000 450
1ea. Lockset	45H7TA3H
1ea. Closer	8916 SPA
1ea. Kickplate	KO050
3ea. Silencers	1229A

Hardware Set #18 119A,119B,147A,147B,

1ea. Cylinder 1E74

Note: Balance of hardware by door supplier.

Hardware Set #19 121A,121B,

SCHOOL RENOVATION AND ADDITION
PAYNEVILLE, KENTUCKY

6ea. Hinges	BB5004 450
2ea. Exit Device	F9400B LBR L YT08
2ea. Cylinders	1E74 X 1E72
2ea. Closer	8916 SPA
2ea. Kickplate	KO050
2ea. Magnetic H.O.	EM508 24120
1ea. Gasketing	797B

Hardware Set #20 123,124,130,131,

3ea. Hinges	BB5004 450
1ea. Deadbolt	48H7R
1ea. Push Plate	1001-9 710
1ea. Pull Plate	1018-3B 710
1ea. Closer	8916 AF
1ea. Kickplate	KO050
1ea. Wall Stop	1278CXCP
3ea. Silencers	1229A

Hardware Set #21 132A,

6ea. Hinges	BB5004 450
2ea. Exit Device	F9400B LBR L YT08
2ea. Cylinders	1E74
2ea. Closer	8916 SPA
2ea. Kickplate	KO050
2ea. Wall Stops	1278CXCP
1ea. Gasketing	797B

Hardware Set #22 133A,

3ea. Hinges	BB5004 450
1ea. Exit Device	F9300B L YT08
1ea. Cylinders	1E74
1ea. Closer	8916 SPA

SCHOOL RENOVATION AND ADDITION
PAYNEVILLE, KENTUCKY

1ea. Kickplate	KO050
1ea. Wall Stops	1278CXCP
1ea. Gasketing	797B

Hardware Set #23 134A,134B,135A,135B,

3ea. Hinges	BB5004 450
1ea. Exit Device	CD9300B L YT08
2ea. Cylinders	1E74
1ea. Closer	8916 SDST
1ea. Kickplate	KO050
1ea. Wall Stops	1278CXCP
3ea. Silencers	1229A

Hardware Set #24 136B,136C,

3ea. Hinges	BB5000 450
1ea. Passage	45H0N3H
1ea. Wall Stop	1278CXCP
1ea. Door Bottom	370A
1ea. Gasketing	797B

Hardware Set #25 143,144,

6ea. Hinges	BB5004 450
1ea. Exit Device	CD9400B LBR L YT03
1ea. Exit Device	CD9400B LBR L YT02
2ea. Cylinders	1E74 X 1E72
2ea. Closer	8916 SDST
2ea. Kickplate	KO050
2ea. Door Bottom	370A
1ea. Gasketing	797B
2ea. Astragals	964C

Hardware Set #26 143A,

3ea. Hinges	BB5004 450
1ea. Exit Device	CD9400B LBR L YT03
1ea. Cylinders	1E74 X 1E72

SCHOOL RENOVATION AND ADDITION
PAYNEVILLE, KENTUCKY

1ea. Closer	8916 SDST
1ea. Kickplate	KO050
1ea. Door Bottom	370A
1ea. Gasketing	797B

Hardware Set #27 144A,151,153,

3ea. Hinges	BB5000 450
1ea. Lockset	45H7D3H
1ea. Closer	8916 DST
1ea. Kickplate	KO050
3ea. Silencers	1229A

Hardware Set #28 T1

1ea. Hinge	CB51 4-1/2 X 4-1/2
2ea. Hinges	SP81 4-1/2 X 4-1/2
1ea. Privacy	93K0L15D
1ea. Coat Hook/Stop	7010
1ea. Wall Stop	1278CXCP
3ea. Silencers	1229A

Hardware Set #29 T2

2ea. Hinges	SP81 4-1/2 X 4-1/2
1ea. Privacy	93K0L15D
1ea. Coat Hook/Stop	7010
3ea. Silencers	1229A

END OF SECTION 08710

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Glass for storefront framing and hollow metal framing.
 - 2. Glazing sealants and accessories.
 - 3. Translucent glazing units and 1" glazing units.
- B. Related Requirements:
 - 1. Section 084113 "Aluminum-Framed Entrances and Storefronts" for associated aluminum framing.
 - 2. Section 081113 "Hollow Metal Doors and Frames".

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of the following products; 12 inches (300 mm) square.
 - 1. Insulating glass (typical and spandrel).
 - 2. Translucent insulating glass.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For glass.
- C. Preconstruction adhesion and compatibility test report.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Install glazing in mockups specified in Section 084113 "Aluminum-Framed Entrances and Storefronts" to match glazing systems required for Project, including glazing methods.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

1.11 WARRANTY

- A. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass

breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Glass Product: Subject to compliance with requirements, provide PPG Solarban 60 on Low-E product indicated or comparable product by one of the following:
 1. Guardian Industries Corp.; SunGuard.
 2. Pilkington North America.
 3. PPG Flat Glass; PPG Industries, Inc.
- B. Glass Fabricators: Acceptable fabricators of Sealed Glass Units, Heat-Strengthened Glass, Tempered Glass and Spandrel Glass:
 1. Oldcastle Building Envelope
 2. Glenny Glass
 3. Trulite Glass and Aluminum Solutions, LLC
 4. Viracon, Inc.
- C. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
 1. Obtain tinted glass from single source from single manufacturer.
 2. Obtain reflective-coated glass from single source from single manufacturer.
- D. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
 1. Design Wind Pressures: As indicated on Drawings.
 2. Design Snow Loads: As indicated on Drawings.
 3. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
 4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
 5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 2. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 3. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 4. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: "Glazing Manual."
 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
1. Minimum Glass Thickness for Exterior Lites: 6 mm.
 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
1. Ultra-Clear (Low Iron) Float Glass with minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
1. Sealing System: Dual seal, with polyisobutylene and silicone primary and secondary sealants.
 2. Spacer: Manufacturer's standard spacer material and construction.
 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.6 GLAZING SEALANTS

- A. General:
1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Field-applied sealants shall have a VOC content of not more than 250 g/L.
 4. Sealants shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 5. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Acid-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corporation; Construction Systems.
 - b. Dow Corning Corporation; DOW CORNING® 999A SILICONE GLAZING SEALANT.
 - c. GE Construction Sealants; Momentive Performance Materials Inc; SCS1000 Contractors.
 - d. Sika Corporation; Sikasil-GP.

2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.9 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 2. Presence and functioning of weep systems.
 3. Minimum required face and edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 INSULATING GLASS SCHEDULE

- A. Glass Type: Low-E-coated, insulating glass.
 - 1. Basis-of-Design Product: PPG Solarban 60 on Solar Gray Low E #2.
 - 2. Overall Unit Thickness: 1 inch (25 mm).
 - 3. Minimum Thickness of Each Glass Lite: 1/4 inch.
 - 4. Outdoor Lite: Clear fully tempered float glass.
 - 5. Interspace Content: Air.
 - 6. Indoor Lite: Clear annealed float glass.
 - 7. Low-E Coating: Sputtered on second surface.
 - 8. Winter Nighttime U-Factor: .29 maximum.
 - 9. Summer Daytime U-Factor: .27 maximum.
 - 10. Visible Light Transmittance: 35 percent minimum.
 - 11. Solar Heat Gain Coefficient: .25 maximum.
- B. Glass Type: Low-E-coated, insulating glass spandrel units.
 - 1. Basis-of-Design Product: PPG Solarban 60 on Solar Gray Low E #2.

2. Overall Unit Thickness: 1 inch (25 mm).
3. Minimum Thickness of Each Glass Lite: 1/4 inch.
4. Outdoor Lite: Clear fully tempered float glass.
5. Interspace Content: Air.
6. Indoor Lite: Clear annealed float glass.
7. Ceramic Frit (Manufacturer's Standard Selection) on Surface No. 4.
8. Low-E Coating: Sputtered on second surface.
9. Winter Nighttime U-Factor:.29 maximum.
10. Summer Daytime U-Factor:.27 maximum.
11. Visible Light Transmittance: 35 percent minimum.
12. Solar Heat Gain Coefficient:.25 maximum.

C. Glass Type: Translucent insulating glass.

1. Basis-of-Design Product:
2. Overall Unit Thickness: 1 inch (25 mm).
3. Minimum Thickness of Each Glass Lite: 1/4" inch.
4. Outdoor Lite: Clear fully tempered.
5. Interspace Content:
6. Indoor Lite: Clear annealed float glass.
7. Winter Nighttime U-Factor:
8. Summer Daytime U-Factor:
9. Visible Light Transmittance:
10. Solar Heat Gain Coefficient:

END OF SECTION 088000

SECTION 092100 - SPRAY-ON ACOUSTICAL TREATMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Spray-on acoustical treatment for installation over ribbed metal deck, existing tectum and walls where noted on drawings.
 - 2. The work to be performed under this section shall include all materials, equipment, labor and services required to install the sprayed cellulose fiber in accordance with these specifications and as indicated.
 - 3. A representative surface of not less than 100 square feet shall be sprayed and approved by the Architect and/or Owner prior to proceeding.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

- B. Provide two copies of independent test reports of:

Light reflectivity minimum 81 + Arctic White
73 + White

NRC VALUES per ASTM C-423 conducted by a NVLAP certified testing laboratory: Minimum NRC of .75 for every 1" of thickness.

Flame Spread Index 5 ASTM E-84/UL 723
Smoke Developed 5 ASTM E-84/UL 723

Bond Strength:

K-13 >600 psf ASTM E-736

Compression Strength:

K-13 >400 psf ASTM E-761

- C. Manufacturer's written certification that product contains no asbestos, fiberglass or other man made mineral fibers.
- D. Maintenance data in the form of manufacturer's printed instructions for cleaning and maintaining acoustical treatment.
- E. K-13 Insulation, Provide two copies of independent test reports of the following:
 - R-Value= Minimum 3.8 per inch per ASTM C-518
 - Bond Strength= >100psf ASTM E-736
 - Flame Spread= Class 1, Class A per ASTM E-84/ UL 723
 - Minimum Thickness= 1 1/2"

1.4 QUALITY ASSURANCE

- A. Materials shall be delivered in original, unopened containers bearing name of manufacturer, product identification and reference to U.L.
- B. Store materials off ground, under cover and away from damp surfaces and keep material dry at all times. Protect liquid adhesive from freezing.
- C. Clips, hangers, supports, sleeves and other attachments to spray bases are to be placed by other trades prior to the application of sprayed insulation.
- D. Ducts, piping, conduit or other suspended equipment shall not be positioned until after the application of sprayed insulation.
- E. Contractor must use a total system, encompassing equipment, fiber and adhesive as supplied and tested by the manufacturer. No substitution may be made.
- F. Contractor must be licensed and trained by the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:
 - 1. International Cellulose Corporation
12315 Robin Boulevard
Houston, TX 77045
(713) 433-6701 or (800) 444-1252
Fax: (713) 433-2029

2.2 MATERIALS

- A. K-13 Acoustical Treatment at all locations noted on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The acoustical contractor shall examine all surfaces and report all unsatisfactory conditions in writing to the General Contractor and Architect. The work shall not proceed until unsatisfactory conditions are corrected.
- B. Provide masking, drop cloths or other satisfactory coverings for all materials/surfaces which are not to receive insulation so as to prevent damage from overspray.
- C. Surfaces to receive spray insulation shall be inspected prior to application to determine if priming/sealing is required to insure bonding and/or to prevent discoloration by migratory stains. Prime accordingly.
- D. The work shall be coordinated with other trades whose work may be affected or have an effect on the installation.

- E. Installation, clean-up and curing shall be accomplished according to manufacturer's recommendations and common construction standards.
- F. Provide natural or mechanical ventilation continuously to properly cure the insulation.

END OF SECTION 092100

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
 - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.
- B. Related Requirements:
 - 1. Section 061600 "Sheathing"
 - 2. Section 092900 "Gypsum Board"

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
- B. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.

1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
 - b. Depth: As indicated on Drawings.
 2. Dimpled Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 0.025 inch (0.64 mm).
 - b. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide the following:
1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Blazeframe Industries; Bare Slotted Track (BST/BST 2).
 - 2) Fire Trak Corp.
 - 3) Metal-Lite; The System.
- D. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
 2. Depth: 7/8 inch (22.2 mm).

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-(1.59-mm-) diameter wire, or double strand of 0.048-inch-(1.21-mm-)diameter wire.
- B. Hanger Attachments to Concrete:
 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Postinstalled, expansion anchor.
 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- D. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
 - 2. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.

- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - 3. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - 4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:
 - 1. Screw to wood framing.
 - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Hangers: 48 inches (1219 mm) o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension

system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

- a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Do not attach hangers to steel roof deck.
 5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Tile backing panels.
- B. Related Requirements:
 - 1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
 - 2. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Gypsum
 - 2. CertainTeed Corporation
 - 3. Georgia-Pacific Building Products
 - 4. National Gypsum Company
 - 5. United States Gypsum Company
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
 - 1. Thickness: 1/2 inch (12.7 mm) and 5/8 inch (15.9 mm).
 - 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch (15.9 mm).
 - 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 - 1. Thickness: 1/2 inch (12.7 mm) and 5/8 inch (15.9 mm).
 - 2. Long Edges: Tapered.
- E. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 2.
 - 1. Core: 5/8 inch (15.9 mm), Type X.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- F. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 SPECIALTY GYPSUM BOARD

- A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Gypsum; FireBloc® Type C Gypsum Wallboard.
 - b. CertainTeed Corporation; ProRoc Type C.
 - c. Georgia-Pacific Building Products; Gold Bond Brand Fire-Shield C Wallboard.
 - d. Lafarge North America Inc; Firecheck Type C.
 - e. National Gypsum Company; Gold Bond Fire-Shield C.
 - f. United States Gypsum Company; Firecode C Core.
2. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
3. Long Edges: Tapered.

2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corporation; FiberCement BackerBoard.
 - b. Custom Building Products; EasyBoard.
 - c. National Gypsum Company; PermaBase BRAND Cement Board.
 - d. United States Gypsum Company; DUROCK Cement Board.
2. Thickness: 1/2 inch (12.7 mm).
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. Expansion (control) joint.

- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Fry Reglet Corporation.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
- 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
 - 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
- D. Joint Compound for Tile Backing Panels:
 - 1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

- D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Grabber Construction Products; Acoustical Sealant GSC.
 - b. Specified Technologies, Inc; Smoke N Sound Acoustical Sealant.
 - c. United States Gypsum Company; SHEETROCK Acoustical Sealant.
- E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-(6.4- to 9.5-mm-)wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-(6.4- to 12.7-mm-)wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 1. Wallboard Type: As indicated on Drawings.
 2. Type X: As indicated on Drawings.
 3. Ceiling Type: As indicated on Drawings.
 4. Abuse-Resistant Type: As indicated on Drawings.
 5. Moisture- and Mold-Resistant Type: As indicated on Drawings.
 6. Type C: Where required for specific fire-resistance-rated assembly indicated.
- B. Single-Layer Application:
 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

3.4 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use where indicated.
- C. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile.
 3. Level 5: At all occupiable locations, unless noted otherwise on drawings..
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.8 GYPSUM BOARD FINISH LEVEL DEFINITIONS (PER ASTM C 840 AND GYPSUM ASSOCIATION STANDARD)

- A. Level 0
1. This level requires no taping, finishing, or corner beads.
- B. Level 1
1. All interior angles and joints should have tape set into joint compound. The surface should be free of excess joint compound. Ridges and tool marks are acceptable. At this level, fasteners are not necessarily covered.
- C. Level 2
1. At this level, all interior angles and joints should have tape embedded in joint compound and wiped with a trowel or joint knife, leaving a thin coating of compound. Fastener heads, corner beads, and other accessories are covered with a coat of joint compound. Ridges and tool marks are acceptable, but the surface should not have excess joint compound. If joint compound is applied over the tape when it is embedded, this is considered a separate coat of compound to satisfy the requirements of this level. Typically applies to tile substrate, where appearances are not important.

D. Level 3

1. All joints and interior angles should have tape that's embedded in joint compound plus one additional coat of joint compound. Accessories and the heads of fasteners must be covered with two separate coats of joint compound. All joint compound must be smooth and free of ridges and tool marks. For Level 3 and above, the prepared surface should be coated with a drywall primer that's compatible with the wallcovering, paint, or other decoration being applied to it.

E. Level 4

1. All joints and interior angles should have tape that's embedded in joint compound plus two separate coats of compound over all flat joints and one separate coat over interior angles. Accessories and fastener heads are covered with three separate coats of joint compound. All joint compound is smooth and free of ridges and tool marks.

F. Level 5

1. All joints and interior angles have tape that's embedded in joint compound plus two separate coats of compound over all flat joints and one separate coat over interior angles. Accessories and fastener heads are covered with three separate coats of joint compound. A thin skim coat of joint compound is applied over the entire surface. The surface should be smooth and free of ridges and tool marks

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Ceramic tile.
 - 2. Stone thresholds.
 - 3. Crack isolation membrane.
 - 4. Non- Ceramic Trim, Transition and Finishing Strips
- B. Related Sections:
 - 1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 2. Section 092900 "Gypsum Board" for cementitious backer units.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

1.5 MATERIALS MAINTENANCE SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.6 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile of each type from one source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Stone thresholds.
 - 2. Crack isolation membrane.
 - 3. Joint sealants.
 - 4. Non-Ceramic Trim, Transitions and Finishing Strips
- D. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

- A. Tile Type: Wall Tile in Media Center and Floor Tile in Restrooms.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide FloridaTile Cellar HDP Series or comparable product by one of the following:
 - a. Florida Tile, Inc (Basis of Design)
 - b. Crossville, Inc
 - c. Daltile
 - d. American Olean; a division of Dal-Tile Corporation.
 - 2. Composition: Porcelain.
 - 3. Module Size: 8 inches by 36 inches.
 - 4. Surface: Slip-resistant, with abrasive admixture.
 - 5. Tile Pattern: Running Bond Pattern.
 - 6. Grout Color: Basis of Design, TEC from manufacturer's full range of colors.
 - 7. Base: 8" high x 36".
- B. Tile Type: Restroom Walls

1. Basis-of-Design Product: Subject to compliance with requirements, provide Mosa Tile or comparable product by one of the following:
 - a. Mosa Tile (Basis of Design)
 - b. Daltile
 - c. Florida Tile, Inc.
 - d. American Olean; a division of Dal-Tile Corporation
2. Face Size: 6 inches by 6 inches.
3. Tile Color and Pattern: Colors and Patterns as indicated on the construction drawings from Mosa Tiles full range of colors (Equal product must provide same color range as Mosa Tile at no additional charge).
Grout Color: Basis of Design TEC from manufacturer's full range of colors.

2.3 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.
 1. Description: Uniform, fine- to medium-grained white stone with gray veining.
 2. Description: Match Architect's sample.

2.4 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
 1. Products: Subject to compliance with requirements,
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. TEC; H.B. Fuller Construction Products Inc Basis of Design Hydraflex (TA 316).

2.5 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Basis of Design TEC or comparable product by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc; LATICRETE 3N1 (All porcelain tile).

c. TEC; H.B. Fuller Construction Products Inc.

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

*Mortar (glass only) Laticrete – Manufacturer Sens – Glass tile adhesive.

2.6 GROUT MATERIALS

A. High Performance Grout:

1. Manufacturers: Basis of Design TEC Power Grout
 - a. Laticrete, Perma Color PRO
 - b. Custom Building Products
2. Colors: Manufacturer's full range of color, refer to tiles listed above for preliminary color selections. Final approval and color selection to occur during construction.

2.7 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 079200 "Joint Sealants."

1. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

D. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

E. Chemical-Resistant Sealants: For chemical-resistant floors, provide chemical-resistant elastomeric sealant of type recommended and produced by chemical-resistant mortar and grout manufacturer for type of application indicated, with proven service record and compatibility with tile and other setting materials, and with chemical resistance equivalent to mortar/grout.

2.8 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Finish, style and dimensions as indicated on drawings, for setting using tile mortar adhesive.

1. Manufacturers:

- a. Schluter-Systems: www.schluter.com

- b. Genesis APS International: www.genesis-aps.com
- c. Blanke: www.blanke.com
- d. Doral

2. Profiles: As indicated on Drawings and called out below.

- a. Jolly(AMGB)
- b. Reno- TK (AE) (Transition between ceramic tile and rubber floor tile)
- c. Shiene- (AE 100)

2.9 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- C. Wall and Floor Tile Levelers: Contractor's option to use leveling compound or leveling spacers as listed below:
 - 1. Self-Leveler Manufacturers: Basis of Design TEC EZ Level with TEC 560 Multipurpose Primer
 - a. Custom Building Products
 - b. Laticrete
 - c. TEC
 - 2. Spacer/ Leveler Manufacturers: Basis of Design

2.10 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances

that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

- a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Exterior tile floors.
 - b. Tile floors in wet areas.
 - c. Tile swimming pool decks.
 - d. Tile floors in laundries.
 - e. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
 - f. Tile floors composed of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Glazed Wall Tile: 1/16 inch (1.6 mm).
 - 2. Decorative Thin Wall Tile: 1/16 inch (1.6 mm).
 - 3. Wood Floor Tile: 1/8 inch (1.8 mm)
- F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- H. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 - 1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
- I. Metal Edge Strips: Install at locations indicated.

3.4 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.5 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove epoxy grout residue from tile as soon as possible.

2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
 - C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
 - D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 450 or less.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
 - 2. Suspension System: Obtain each type from single source from single manufacturer.
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- D. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface according to ASTM E 795.
- E. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANELS Type ACT-1

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong "Fine Fissured" or comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. Chicago Metallic Corporation.
3. United States Gypsum Company.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.

C. Color: White.

D. LR: Not less than 0.80.

E. NRC: Not less than 0.55.

F. CAC: Not less than 30.

G. Edge/Joint Detail: Tegular Edge.

H. Thickness: 5/8 inch (15 mm).

I. Modular Size: 24 by 24 inches (610 by 610 mm).

J. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 ACOUSTICAL PANELS – TYPE ACT-2

A. Panel Characteristics: Vinyl clad gypsum board. Gypsum board with sealed edges, formulated especially for ceiling application in humid or exterior environments.

1. Modular Size: 24 by 24 inches
2. Thickness: 5/8 inch
3. Finish: Unperforated vinyl film.
4. Color: White
5. Light Reflectance Coefficient: Not less than 0.75
6. CAC: Not less than 40
7. Products with properties specified, which are comparable in appearance to the following, will be considered:
 - a. Series: Armstrong Ceramaguard panels laminated vinyl surface, or approved equal.

2.5 ACOUSTICAL PANELS – TYPE ACT-3

A. Basis of Design: Armstrong "Optima" or comparable by the manufacturers listed above.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.

- C. Color: White.
- D. LR: Not less than 0.80.
- E. NRC: Not less than 0.90.
- F. CAC: Not less than 30.
- G. Edge/Joint Detail: Tegral Edge.
- H. Thickness: 1 inch.
- I. Modular Size: 24 by 24 inches (610 by 610 mm).
- J. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.6 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion anchors.
 - 2. 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 hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
- D. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

- F. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.

2.7 METAL SUSPENSION SYSTEM- TYPE A

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong "Prelude ML 15/16" or comparable product by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Chicago Metallic Corporation; 200 Snap Grid.
 - 3. United States Gypsum Company.
- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation; with prefinished 15/16-inch-(24-mm-) wide metal caps on flanges.
 - 1. End Condition of Cross Runners: butt-edge type.
 - 2. Face Design: Flat, flush.
 - 3. Cap Material: Steel cold-rolled sheet.
 - 4. Cap Finish: Painted white.

2.8 METAL EDGE MOLDINGS AND TRIM-

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Armstrong World Industries, Inc (Basis of Design: Axiom Classic)
 - 2. Chicago Metallic Corporation.
 - 3. United States Gypsum Company.
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.9 ACOUSTICAL SEALANT

- A. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Provide at full perimeter of ceiling for all spaces receiving suspended ceiling.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 7. Do not attach hangers to steel deck tabs.
 - 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 9. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
 - 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 - 2. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
 - 3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 095423 - LINEAR METAL CEILINGS

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 strip, linear metal pans and suspension systems for ceilings.

1.3 DEFINITIONS

- A. LR: Light Reflectance coefficient.
- B. NRC: Noise Reduction Coefficient.

1.4 COORDINATION

- A. Coordinate layout and installation of linear metal pans and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For components with factory-applied color and other decorative finishes.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Linear pattern.
 - 2. Joint pattern.
 - 3. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
 - 4. Ceiling perimeter and penetrations through ceiling; trim and moldings.
 - 5. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96).

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Linear Metal Ceiling Components: Quantity of each pan, carrier, accessory, and exposed molding and trim equal to 2 percent of quantity installed.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver linear metal pans, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Handle linear metal pans, suspension system components, and accessories carefully to avoid damaging units and finishes in any way.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Exterior linear metal ceilings shall withstand exterior exposure and the effects of gravity loads and the following loads and stresses without showing permanent deformation of ceiling system components including pans and suspension system; noise or metal fatigue caused by vibration, deflection, and displacement of ceiling pans; or permanent damage to fasteners and anchors:
 - 1. Wind Load: Uniform pressure of 20 lbf/sq. ft. (960 Pa), acting inward or outward.
 - 2. Seismic Criteria: Provide linear metal ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 - a. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580/E 580M.
 - b. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings - Seismic Zones 0-2."
 - c. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies - Seismic Zones 3 & 4."
 - d. ASCE/SEI 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.

- C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 50 or less.

2.2 LINEAR METAL CEILING PANS

- A. Sheet Metal Characteristics: For metal components 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, roughness, stains, or discolorations.
 - 1. Aluminum Sheet: Roll-formed aluminum sheet, complying with ASTM B 209 (ASTM B 209M); alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Pan Fabrication: Manufacturer's standard units of size, profile, and edge treatment indicated, formed from metal indicated to snap on and be securely retained on carriers without separate fasteners, and finished to comply with requirements indicated.
- C. Pan Splices: Construction same as pans, in lengths 8 to 12 inches (200 to 300 mm); with manufacturer's standard finish.
- D. End Caps: Metal matching pans; fabricated to fit and conceal exposed ends of pans.
- E. Filler Strips: Metal matching pans; fabricated to uninterruptedly close voids between pans.
- F. Moldings and Trim: Provide manufacturer's standard moldings and trim for exposed members, and as indicated or required, for edges and penetrations of ceiling, around fixtures, at changes in ceiling height, and for other conditions; of same metal and finish as linear metal ceiling pans.

2.3 METAL SUSPENSION SYSTEMS

- A. Metal Suspension Systems Standard: Provide ceiling manufacturer's standard metal suspension systems of types and finishes indicated that comply with applicable ASTM C 635/C 635M requirements.
- B. Suspension Systems: Provide systems complete with carriers, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, fixture adapters, and other suspension components required to support ceiling units and other ceiling-supported construction.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, Direct Hung, unless otherwise indicated.
- D. Wire Hangers, Braces, and Ties: Provide wire complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
 - 3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
 - 4. Size: Select wire diameter so its stress at 3 times the hanger design load indicated in ASTM C 635/C 635M, Table 1, Direct Hung is less than yield stress of wire, but provide not less than 0.106-inch-(2.69-mm-) diameter wire.

- E. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. Carriers: Factory finished with matte-black baked finish.
 - 1. Main Carriers: Aluminum, not less than 0.240-inch (6.0-mm) rolled sheet, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, complying with ASTM B 209 (ASTM B 209M).
 - 2. Main Carriers: Steel, not less than 0.0209-inch (0.53-mm) nominal thickness, cold-rolled sheet, with factory-applied protective coating, complying with ASTM C 635/C 635M.
 - a. Hot-Dip Galvanized Steel: ASTM A 653/A 653M, not less than G60 (Z180) zinc coating.
- G. Carrier Splices: Same metal, profile, and finish as for carriers.
- H. Stabilizer Channels, Tees, and Bars: Manufacturer's standard components for stabilizing main carriers at regular intervals and at light fixtures, air-distribution equipment, access doors, and other equipment; spaced as standard with manufacturer for use indicated; and factory finished with matte-black baked finish.
- I. Exterior Bracing: Cold-rolled steel channels and angles, hot-dip galvanized to comply with ASTM A 653/A 653M, G60 (Z180) coating designation; size and profile as required to withstand wind load.
- J. Hold-Down Clips: Manufacturer's standard hold-down clips spaced as standard with manufacturer.
- K. Edge Moldings and Trim: Provide exposed members as indicated or required to comply with seismic requirements of authorities having jurisdiction, to conceal edges of penetrations through ceiling, to conceal ends of pans and carriers, for fixture trim and adapters, for fasciae at changes in ceiling height, and for other conditions; of metal and finish matching linear metal pans or extruded plastic unless otherwise indicated.
 - 1. For Circular Penetrations of Ceiling: Fabricate edge moldings to diameter required to fit penetration exactly.

2.4 ALUMINUM PANS AND SUSPENSION SYSTEM FOR LINEAR METAL CEILING.

- A. Aluminum Pans and Suspension System:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong MetalWorks Linear Exterior or comparable product by one of the following:
 - a. Chicago Metallic Corporation.
 - b. Hunter Douglas Architectural Products, Inc.
 - c. United States Gypsum Company.
 - d. Armstrong Industries
- B. Pan Thickness: Not less than 0.032 inch (0.8 mm).
- C. Pan Edge Detail: Square.
- D. Linear Microperforated Module Width and Pan Face Width: 4-inch (102-mm) module width and 3-1/4-inch (83-mm) face width.

- E. Pan Depth: 3/4 inch (19 mm) deep.
- F. Pan Face Finish: High-performance organic coating in color selected from manufacturer's full range.
- G. End Cap, Finish of Exposed Portions: To match pan.
- H. Filler Strip Design: Recessed.
- I. Filler Strip, Finish of Exposed Portions: To match pan.
- J. LR: Not less than 0.75.
- K. Suspension-System Main-Carrier Material: Aluminum.

2.5 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

2.6 ALUMINUM FINISHES

- A. Mill Finish: AA-M10C10.
- B. Lacquered Mill Finish: AA-M10C10R1x with manufacturer's standard clear, organic coating.
- C. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- D. Clear Mirror Anodic Finish: AA-M21C12A212, 0.005 mm or thicker.
- E. Color-Coated Finish: Manufacturer's standard baked paint finish complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.
- F. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2.7 GALVANIZED-STEEL SHEET FINISHES

- A. Color-Coated Finish: Manufacturer's standard powder-coat baked paint finish complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which linear metal ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of linear metal ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of linear metal pans to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width pans at borders, and comply with layout shown on reflected ceiling plans and on Coordination Drawings.

3.3 INSTALLATION

- A. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate to which hangers are attached and for type of hanger involved.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that does not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 7. Do not attach hangers to steel deck tabs.
 - 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 9. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
 - 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- B. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers but

without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

- C. Install edge moldings and trim of type indicated at perimeter of linear metal ceiling area and where necessary to conceal edges and ends of linear metal pans.
 - 1. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system carriers so they are aligned and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Cut linear metal pans for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.
- F. Install linear metal pans in coordination with suspension system and exposed moldings and trim.
 - 1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.
 - 2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.
 - 3. Install pans with butt joints using internal pan splices and in the following joint configuration:
 - a. Aligned.
 - b. Aligned, every other pan length.
 - c. Staggered a minimum of 12 inches (300 mm).
 - d. Random.
 - e. As indicated.
 - 4. Install directionally textured metal pans in directions indicated.
 - 5. Where metal pan ends are visible, install end caps unless trim is indicated.
 - 6. Install filler strips where indicated.
 - 7. Install sound-absorbent pads at right angle to perforated metal pans so pads do not hang unsupported.

3.4 FIELD QUALITY CONTROL

- A. Linear metal ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.
- B. Prepare test and inspection reports.

3.5 CLEANING

- A. Clean exposed surfaces of linear metal ceilings, including trim and edge moldings after removing strippable, temporary protective covering if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish

damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION 095423

SECTION 096466 - WOOD FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes wood athletic flooring system at the Gymnasium.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood athletic flooring.
- B. Shop Drawings: For each type of floor assembly and accessory. Include plans, elevations, sections, details, and attachments to other work. Include the following:
 - 1. Expansion provisions and trim details.
 - 2. Locations of floor inserts for athletic equipment installed through flooring assembly.
- C. Samples for Initial Selection: Manufacturer's color charts showing colors and glosses available for the following:
 - 1. Floor finish.
 - 2. Game-line and marker paint.
- D. Samples for Verification: For each type of wood athletic flooring and accessory required; approximately 12 inches (300 mm) long and of same thickness and material indicated for the Work.
 - 1. Include Sample sets showing finishes and game-line and marker paint colors applied to wood flooring.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wood athletic flooring and finish systems to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual that has been approved by MFMA as an accredited Installer according to the MFMA Accreditation Program.

- B. Installer Qualifications: An experienced Installer who has completed wood athletic flooring installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in installations with a record of successful in-service performance.
 - 1. Installer responsibilities include installation and field finishing of wood athletic flooring components and accessories, and application of game lines and markers.
- C. Maple Flooring: Comply with MFMA grading rules for species, grade, and cut.
 - 1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver assembly materials in unopened cartons or bundles.
- B. Protect wood from exposure to moisture. Do not deliver wood components until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.
- C. Store wood components in a dry, warm, well-ventilated, weathertight location and in a horizontal position.

1.7 FIELD CONDITIONS

- A. Conditioning period begins not less than seven days before wood athletic flooring installation, is continuous through installation, and continues not less than seven days after installation.
 - 1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F (18 and 24 deg C) and relative humidity planned for building occupants, but not less than 35 percent or more than 50 percent, in spaces to receive wood athletic flooring during the conditioning period.
 - 2. Wood Conditioning: Move wood components into spaces where they will be installed, no later than beginning of the conditioning period.
 - a. Do not install wood athletic flooring until wood components adjust to relative humidity of, and are at same temperature as, spaces where they are to be installed.
 - b. Open sealed packages to allow wood components to acclimatize immediately on moving wood components into spaces in which they will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install wood athletic flooring after other finishing operations, including painting, have been completed.

1.8 COORDINATION

- A. Coordinate layout and installation of wood athletic flooring systems with floor inserts for gymnasium equipment.

1.9 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights. Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1. Warranty Period: 1-year from date of Substantial Completion

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide transition thresholds or comparable product by one of the following:

1. Action Floor Systems, LLC.
2. Conner Sports Surface Solutions Basis of Design: "Alliance Fixed Resilient System".
3. Horner Flooring Company, Inc.
4. Robbins Sports Surfaces.

2.2 DESCRIPTION

- A. System Type: Floating system.
- B. Overall System Height: 2-1/4 inches (57 mm).

2.3 PERFORMANCE REQUIREMENTS

- A. Provide wood athletic flooring systems tested by a qualified testing agency according to DIN V 18032-2 and shown to meet the following requirements:
1. Shock Absorption: Minimum 53 percent.
 2. Vertical Deflection: Minimum 0.09 inch (2.3 mm).
 3. Area of Deflection: Maximum 15 percent.
 4. Ball Bounce: Minimum 90 percent.
 5. Surface Friction: Not less than 0.5 or more than 0.7.
 6. Rolling Loads: No damage when subjected to 337 lbf (1500 N) applied through a single wheel.

2.4 FLOORING MATERIALS (Gymnasium)

- A. Random-Length Strip Flooring: Northern hard maple (*Acer saccharum*), kiln dried, random length, tongue and groove, and end matched.
1. Grade: MFMA-RL Second and Better.
 2. Cut: Edge.
 3. Thickness: 25/32 inch (20 mm).
 4. Face Width: 2-1/4 inches (57 mm).

2.5 FINISHES

- A. Floor-Finish System: System of compatible components recommended in writing by flooring manufacturer, and MFMA approved.
 - 1. Floor-Sealer Formulation: Pliable, penetrating type. MFMA Group 1, Sealers.
 - 2. Finish-Coat Formulation: Formulated for gloss finish indicated and multicoat application.
 - a. Type: MFMA Group 3, Gymnasium-Type Surface Finishes. Finish to Oil Urethane.
 - 3. Game-Line and Marker Paint: Industrial enamel compatible with finish coats and recommended in writing by manufacturers of finish coats, and paint for this use.
- B. Floor-Finish System: Clear Matte or Satin Finish.

2.6 ACCESSORIES

- A. Vapor Retarder: ASTM D 4397, polyethylene sheet not less than 6 mils (0.15 mm) thick.
- B. Resilient Wall Base: Molded, vented, rubber or vinyl cove base; 4 by 3 by 48 inches (100 by 75 by 1200 mm); with pre-molded outside corners.
 - 1. Color: Black.
- C. Thresholds: ADA compliant resilient threshold for wood floor system to concrete substrate conditions.
 - 1. Provide transition strip between wood assembly and resilient threshold.
- D. Fasteners: Type and size recommended by manufacturer, but not less than those recommended by MFMA for application indicated.
- E. Resilience Pads: 3/4" pads per manufacturer's system.
- F. Plywood substrate: Provide two (2) layers of 1/2- inch plywood

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of wood athletic flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Concrete Slabs: Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

3.2 PREPARATION

- A. Remove coatings including curing compounds and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone; use mechanical methods recommended by manufacturer. Do not use solvents.

- B. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. General: Comply with wood athletic flooring manufacturer's written instructions, but not less than written recommendations of MFMA applicable to flooring type indicated.
- B. Pattern: Lay flooring to orient the length of the gym.
- C. Vapor Retarder: Cover entire slab area beneath wood flooring. Install with joints lapped a minimum of 6 inches (150 mm) and sealed.
- D. Subfloor:
 - 1. Install sleepers perpendicular to direction of flooring, staggering end joints a minimum of 24 inches (610 mm).
 - 2. Space at spacing recommended by manufacturer for system components indicated.
 - 3. Shim and level sleepers and install anchors at spacing recommended by manufacturer, but not less than 30 inches (760 mm) o.c.
 - 4. Provide 1-1/2" expansion voids at perimeter and at vertical obstructions.
 - 5. Install solid blocking at doorways, under bleachers in the stacked position, and below portable goals.
- E. Maple Flooring:
 - 1. Install maple flooring parallel to main playing court by power nailing or stapling at all sleeper locations. End joints shall be properly driven up.
 - 2. If required, size joints between flooring strips to allow for intermediate expansion in accordance with local humidity conditions.
 - 3. Provided 1-1/2" expansion voids at perimeter and at all vertical obstructions.

3.4 SANDING AND FINISHING

- A. Allow installed flooring to acclimate to ambient conditions before sanding.
- B. Follow applicable recommendations in MFMA's "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing, and Resurfacing of Maple Gym Floors."
- C. Machine sand with coarse, medium, and fine grades of sandpaper to achieve a level, smooth, uniform surface without ridges or cups. Remove sanding dust by tack or vacuum.
- D. Finish: Apply seal and finish coats of finish system according to finish manufacturer's written instructions. Provide no fewer than four coats total and no fewer than two finish coats.
 - 1. Water-Based Finishes: Use finishing methods recommended by finish manufacturer to reduce grain raise and sidebonding effect.
 - 2. Game-Line and Marker Paint: Apply game-line and marker paint between final seal coat and first finish coat according to paint manufacturer's written instructions.
 - a. Mask flooring at game lines and markers, and apply paint to produce lines and markers with sharp edges.

- b. Where game lines cross, break minor game line at intersection; do not overlap lines.
 - c. Apply game lines and markers in widths and colors according to requirements indicated on Drawings.
 - d. Apply finish coats after game-line and marker paint is fully cured.
- 3. Logo (Center Court): Apply between final and seal coat and first finish coat according to paint manufacturer's written instructions.

3.5 PROTECTION

- A. Protect wood athletic flooring during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.
 - 1. Do not cover flooring after finishing until finish reaches full cure and not before seven days after applying last finish coat.
 - 2. Do not move heavy and sharp objects directly over flooring. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096466

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient molding accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of product indicated.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC-RUBBER BASE.

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong World Industries, Inc.
 2. Flexco
 3. Burke Mercer Flooring Products
 4. Nora Systems, Inc.
 5. Roppe Corporation, USA
 6. Musson Rubber Co.
 7. Johnsonite; A Tarkett Company
- B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
1. Group: I (solid, homogeneous).
 2. Style and Location:
 - a. Style B, Cove: Provide in areas with resilient flooring.
- C. Thickness: 0.125 inch (3.2 mm).
- D. Height: 4 inches (102 mm).
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Preformed.
- G. Inside Corners: Preformed.
- H. Colors: As selected by Architect from full range of industry colors.

2.2 RUBBER MOLDING ACCESSORY.

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Refer to list of approved manufacturers in section 2.1.A
- B. Description: Rubber nosing for carpet, reducer strip for resilient flooring, and transition strips..

- C. Profile and Dimensions: As indicated.
- D. Locations: Provide rubber molding accessories in areas indicated.
- E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.

- b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.

- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

- A. Vinyl Composition Tile
- B. Installation accessories.
- C. Floor prep requirement at existing floor slab.

1.03 REFERENCE STANDARDS

- A. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2008b.
- B. ASTM F 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2008.
- C. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant; Federal Specifications and Standards; Revision E, 1994.
- D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 2006.
- E. RFCI - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute; 1998.
- F. Testing procedure (performed by Owner's testing agent new and existing concrete slabs).
 - 1. RH test ASTM 2170-11, utilizing Vicella II testing equipment and components.

1.04 SUBMITTALS

- A. See Division 01, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Sherman Carter Barnhart, PSC's initial selection.
- D. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.
- F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- G. Maintenance Materials: Furnish the following for Russell County School's use in maintenance of project.
 - 1. See Division 01, for additional provisions.
 - 2. Extra VCT Flooring Material: Furnish one-box for every 50 boxes or fraction thereof for each type, color and pattern of floor tile installed.

1.07 QUALITY ASSURANCE

- A. At existing concrete floor slabs, the floor finish contractor shall coordinate the services of the Owner's testing agency to conduct RH moisture test ASTM 2170-11, minimum initial 2 per room of applicable adhered floor finish areas and 2 per room of applicable adhered floor finish areas

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following initial 2 tests and any additional testing as recommended or required by flooring and adhesive manufacturers. All costs associated with testing and any retests shall be at the expense of the Owner. No floor finishes shall be installed at areas that have not passed referenced tests in full compliance with floor finish and adhesive manufacturer written requirements.

Floor finish contractor shall conduct ASTM F170 periodic testing as required for installation and as recommended by flooring manufacturer. Results of contractor testing shall be forwarded to the Construction Manager and Architect. All testing results obtained by the Owner's testing agent and the finish contractor shall be submitted immediately to the Architect and Construction Manager.

- B. At existing concrete floor slabs, floor finish contractor to advise the Architect and Construction Manager, in writing, the time frame required by the floor finish and adhesive manufacturers, for controlled environmental conditions, air temperature and humidity levels, prior to floor testing and installation. This information shall be discussed and coordinated with all parties during the concrete slab pre-installation conference.
 - 1. Floor finish contractor to monitor daily environmental conditions, temperature and humidity levels, within the building prior to testing and floor finish **installations**. Proceeding with installation of schedule finish indicates the installing contractor has determined the environmental conditions are acceptable and meet the requirements of the manufacturers.
 - 2. An installation schedule shall be developed by the finish contractor. Schedule shall include time requirements for environmental conditioning of spaces and concrete testing at areas scheduled to receive adhered floor finish materials. Project specific testing time must be coordinated and confirmed with Owner's testing agency during initial construction coordination and scheduling meetings. Installation scheduling shall be coordinated with construction schedule accordingly.
 - 3. During floor finish installations floor finish contractor to document and log daily environmental conditions within areas (rooms) being worked in. Logs to include temperature and humidity levels present at time of installation. Logs are to be submitted with floor finish warranty and close out documents
- C. At existing concrete floor slabs, where existing finishes are removed, floor finish contractor to remove all adhesives, oils or concrete surface contaminants that will interfere with new finishes and adhesives, include light floor sanding at all existing slabs scheduled to receive new adhered finishes. If contractor utilizes mechanical means for removal of existing finishes and adhesives such as shot / bead blasting, contractor shall include a minimum 1/8" Ardex cementitious feather finish skim coat. If contractor utilizes chemical solvents for removal, contractor shall wash and/or chemically prep floor as required by adhesive and floor manufacturers.

1.06 FIELD CONDITIONS

- A. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).
- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

1.07 WARRANTIES

- A. Special adhered flooring installation Warranty: Flooring contractor to provide special 2 year floor finish installation warranty beginning on the date of substantial completion, warranting the floor finish installations from adhesive failure, full or partial, resulting from conditions present at the time of installation.

PART 2 - PRODUCTS

2.01 TILE FLOORING

- A. Products: Subject to compliance with requirements, provide one of the following:

1. Armstrong World Industries, Inc.
2. Azrock Commercial Flooring, DOMCO.
3. Mannington Mills, Inc.: Essentials and Designer Essentials
4. Tarkett, Inc.

2.02 ACCESSORIES

- A. Self drying, cement-based finishing underlayment – Basis of Design: Ardex Feather Finish or approved equal.
- B. Resilient Flooring Moisture Limiter:
 1. Provide product with unlimited 100% relative humidity, unlimited warranty protection.
 2. Installer of product must have five years minimum experience, certified by product manufacturer, and minimum 10 successful projects in the last five years.
 3. Contractor shall shot blast or bead blast existing floor slab and install 1/8" minimum cementitious Ardex feather finish underlayment or equal.
 4. Warranty: Provide 10 year limited warranty for materials and labor for damaged floor materials.
- C. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.
 1. VCT adhesive: RH 85 minimum adhesive per manufacturer's standards / recommendations.
- D. Resilient Tile: Acrylic floor finish: (2) coats each of types recommended by flooring manufacturer. Prepare floor prior to application as recommended by flooring manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Verify that concrete sub-floor and underlayment surfaces are dry enough and ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings.
- B. Contractor shall remove all existing adhesives, underlayment, etc., as required by flooring manufacturer. Provide smooth, level, "like new" floor. Installation free of dimples, telegraphing of crack and other deformities. All work shall be performed per manufacturer's standards and environmental requirements.
- C. Prepare sub-floor surfaces as recommended by flooring and adhesive manufacturers.
- D. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- E. Prohibit traffic until filler is cured.
- F. Clean substrate.
- G. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION

- A. Refer to Room Finish Groups for resilient flooring locations.
- B. Starting installation constitutes acceptance of sub-floor conditions.
- C. Contractor shall provide new cement based underlayment / leveling compound as specified. Contractor to prep existing and new slabs as required by manufacturer. Contractor to feather finish as required to accommodate existing flooring conditions. Prior to installation, all existing cracks / voids in floor per underlayment manufacturer's recommendation.
- D. Provide moisture limiter over existing slab per manufacturer's instructions.
- E. Spread only enough adhesive to permit installation of materials before initial set.
- F. Fit joints tightly.
- G. Set flooring in place, press with heavy roller to attain full adhesion.
- H. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- I. Install edge strips at unprotected or exposed edges, where flooring terminates at all transitions to other floor finishes, and where indicated.
 - 1. Metal Strips: Attach to substrate before installation of flooring using stainless steel screws.
 - 2. Refer to drawings and details.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION – ACCESSORIES

- A. At existing concrete floor slabs, flooring adhesives shall be as recommended by floor finish manufacturer for accepted field or accepted environmental conditions present at the time of installation but not less than RH 85 adhesives.
- B. At EXISTING concrete floor slabs on grade, floor finish and adhesive manufacturer and floor finish contractor is to assume no vapor barrier or vapor retarder is present under existing concrete floor slab. The floor finish contractor shall include with bid, a moisture vapor reduction coating such as Vapor-Green FC, Koster VAP I 2000 or equivalent. Coating to be compatible with flooring manufacturer finish materials and flooring manufacturer approved adhesives. Floor

finish contractor to field inspect existing conditions prior to bid and confirm any and all accessory requirements required from the floor finish manufacturer for a complete and warranted system. (Provide unit pricing per installed square foot, for vapor reduction coating. Unit pricing to be used to add or remove vapor reduction coating from project)

1. At existing concrete floor slabs on grade, floor finish contractor to include within bid all labor and materials required to fully clean and prepare existing concrete slab to receive vapor reduction coating. Contractor shall shot blast existing floor slabs as required for installation
 2. Floor finish contractor to confirm in writing, with flooring and adhesive manufacturer, compatibility, acceptance and use of vapor reduction coating with the floor finish and adhesive materials and as required to obtain finish and adhesion warranties.
- C. At existing concrete floor slabs, Floor finish contractor to include within project bid, basic slab cleaning and preparation including limited patching, leveling materials and labor as required to achieve a quality finish installation. Floor finish contractor to advise General Contractor/Construction Manager in writing, prior to concrete slab installation, the requirements for slab levelness.

3.04 TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless manufacturer's instructions say otherwise.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.

3.05 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's instructions.
 1. Sweep and vacuum surfaces thoroughly.
 2. Damp mop surfaces to remove marks and soiling.
 3. Prepare new floor finish as required by acrylic floor finish manufacturer and flooring manufacturer.
 4. Provide acrylic floor finish – 2 coats minimum per flooring manufacturer.

3.06 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.
 1. Protect floor coverings from marks, marks, indentations and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
 2. Cover floor coverings with undyed, untreated building paper until Substantial Completion.
 3. Do not move heavy and sharp objects directly over floor coverings. Place plywood or hardboard panels over floor coverings and under objects while they are being moved, sliding or rolling objects over panels without moving panels.
 4. Contractor to monitor environmental conditions as required by floor manufacturer per manufacturer's recommended cure time.

END OF SECTION 096519

SECTION 096813 - TILE CARPETING

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 modular, fusion-bonded carpet tile and modular entrance floor tiles.
- B. Section includes sheet carpet.
- C. Related Requirements:
 - 1. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include installation recommendations for each type of substrate.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Pile direction.
 - 8. Type, color, and location of insets and borders.

9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-(300-mm-)long Samples.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.10 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, loss of face fiber, and delamination.
 - 3. Warranty Period: 20 year warranty.

PART 2 - PRODUCTS

2.1 CARPET TILE.

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Forbo Flotex Cirrus Eclipse carpet tiles or comparable product by one of the following:
 - 1. Basis-of-Design "Forbo Flotex Cirrus Eclipse"
 - 2. Mohawk
 - 3. Tandus

Note: Equal Manufacturer must provide carpet tile of similar pattern and color.

- B. Color: Eclipse.
- C. Pattern: Linear Pattern for field carpet tile as indicated on the Floor Pattern Plan in Media Center and Administration Suite
- D. Size: 20" x 20"

2.2 Sheet Carpet

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Forbo Flotex Metro Nimbus sheet carpet or comparable product by one of the following:
 - 1. Basis-of-Design "Forbo Flotex Metro Nimbus"
 - 2. Mohawk
 - 3. Tandus

Note: Equal Manufacturer must provide carpet tile of similar pattern and color.

- B. Color: Metro Nimbus.
- C. Pattern: Carpet Path through Media Center indicated on the Floor Pattern Plan

2.3

2.4 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
- C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" for slabs receiving carpet tile.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

- D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 097200 – VINYL COATED FABRIC WALLCOVERING

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide vinyl coated fabric wallcovering (vinyl wallcovering), complete.
- B. Related Sections
 - 1. Section 16500 - Lighting: Permanent during installation
 - 2. Section 09255 - Gypsum Board Assemblies: Wall Substrates
 - 3. Section 09910 - Painting: Preparation and priming of substrate surfaces

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. D 751 Methods of Testing Coated Fabrics
 - 2. F 793-93 Classification of Wallcoverings by Durability Characteristics
 - 3. E 84-91a Test Method for Surface Burning Characteristics of Building Materials.
 - 4. E 603-77 (1983) Guide for Room Fire Experiments
 - 5. G 21-90 Recommended Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
 - 6. D 1308-87 Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
- B. Chemicals Fabrics and Film Association (CFFA):
 - 1. CFFA-W-101-B Quality Standard for Vinyl Coated Fabric Wallcovering.
- C. Federal Specifications (FedSpec):
 - 1. CCC-W- 408A Wallcovering, Vinyl Coated
- D. Underwriters Laboratory, Inc. (UL)
 - 1. UL 723: Test for Surface Burning Characteristics of Building Materials
- E. National Bureau of Standards Test Methods (NBS):
 - 1. IR-82-2532
 - 2. IR-82-2634

1.03 SUBMITTALS

- A. Submit manufacturers' product data and installation instructions for each type of wallcovering, adhesive and accessory required.
 - 1. Include data on physical properties, fire hazard classification and fire detection characteristics of wallcoverings.
 - 2. Include manufacturer's recommendations for maximum permissible moisture content of substrates.
- B. Submit full-size samples, 54 inches wide by 36 inches long, cut from current production of each material selected to demonstrate quality, weight, color range and pattern variation.
- C. Submit manufacturer's written product certification that all furnished wallcovering meets or exceeds the specification requirements. Include certified copies of tests specified.
- D. Submit wallcovering manufacturer's written instructions for recommended maintenance of each type of wallcovering required.

Include acceptable methods and materials recommended to maintain products in anticipated areas of use.

1.04 QUALITY ASSURANCE

- A. Manufacturer: Provide each type of vinyl wallcovering required produced by one manufacturer whose published product literature clearly indicates compliance of wallcovering with specified requirements.
- B. Applicator: Installation by skilled commercial wallcovering applicators with no less than three years of documented experience installing wallcovering of the types and extent specified for the project.
- C. Material Standards: Provide materials that meet or exceed Federal Specification CCC-W-408A and CFFA-W-101B Quality Standard for Vinyl Coated Fabric Wallcovering for Type I and Type II wallcovering.
- D. Composition: Provide supported vinyl material consisting of a through pigmented, mildew inhibitorized, polyvinyl chloride film adhered to a pre-shrunk polyester/cotton blend fabric backing.
 - 1. Provide vinyl wallcoverings manufactured without the use of cadmium-containing stabilizers or color pigments.
 - 2. Provide vinyl wallcoverings manufactured using only water base printing inks and coatings and containing no residual amounts of the organic solvents Methyl Ethol Ketone, Methyl Isobutyl Ketone, and Toluene.
 - 3. Stain Resistant Coating: Provide KoroKlear (VicrKlear) delustered acrylic resin liquid topcoating applied by the manufacturer as an integral part of production

providing stain protection from a variety of staining agents and greater ease of cleaning.

- E. Fire Hazard Classification: Provide materials that comply with Class A fire rating when tested in accordance with ASTM E84.
 - 1. Flame Spread: 10
 - 2. Smoke Developed: 5
- F. Underwriters Laboratories approval: Provide materials that have been tested and approved by Underwriters Laboratories. Provide proof of UL labeling on every roll assuring complete compliance with all specifications and requirements through continuous inspection by UL inspectors.
- G. Smoke Toxicity: Provide materials that have been tested for smoke toxicity and approved for use by New York City Materials and Equipment Acceptance Division (MEA).
- H. Fire Detection Characteristics: Provide materials that have been laboratory tested for the Early Warning Effect in accordance with ASTM E 603. Submit test results certifying that when one square foot section of the material is heated to 300 degrees F, the wallcovering emits an odorless, colorless non-toxic vapor that will activate an ionization smoke detector.
- I. Field Test Panels: Prior to the ordering of the material and at no cost to the Owner, install three full width panels of each vinyl wallcovering in an area designated by the Architect. Replace unacceptable panels. Retain approved panels as the standard of comparison for the project.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver vinyl wallcoverings to the project site in unbroken and undamaged original factory wrappings and clearly labeled with the manufacturer's identification label, quality or grade, UL label and lot number.
- B. Store materials in a clean, dry storage area with temperature maintained above 55 degrees with normal humidity.
- C. Store material in a flat position to prevent damage to roll-ends. Do not cross stack material. Support material off the floor in a manner to prevent sagging and warping.

1.06 PROJECT CONDITIONS

- A. Do not apply wallcoverings when surface and ambient temperatures are outside the temperature ranges required by the wallcovering manufacturer.
- B. Provide continuous ventilation and heating facilities to maintain substrate surface and ambient temperatures above 60 degrees F unless required otherwise by manufacturer's instructions.
- C. Apply adhesive only when substrate surface temperature or ambient temperature is above 60 degrees F, or relative humidity is below 40 percent.

- D. Maintain constant recommended temperature and humidity for at least 72 hours prior to and throughout the installation period and for 72 hours after wallcovering installation completion.
- E. Provide not less than an 80-foot candles per square foot lighting level minimum measured mid-height at substrate surfaces.

1.07 WARRANTY

- A. Submit manufacturer's five-year written warranty against manufacturing defects.

1.08 MAINTENANCE

Replacement Materials: Provide not less than (roll/percent) of each type, color and pattern of wallcovering installed for maintenance purposes. Furnish replacement materials from same production run as installed materials. Protect material with clearly marked packaging indicating product identification and project location.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide digital wallcovering by one of the following, or Architect-approved equal.
 1. Basis of Design Manufacturer: Koroseal/Vicrtex Wallcoverings manufactured by RJF International Corporation, Marietta, Ohio.
 2. Chromatics; 625 Fogg Street, Nashville, TN 37203; 615-254-0063
 3. Dreamscape; 40 Vanderhoof Ave. Rockaway, NJ 07866; 973-625-7923

2.02 MATERIALS

- A. Basis of Design: Koroseal Korographics Digital Wallcovering – Custom Image as provided by Owner/Architect
 1. Total Weight: 21 oz. Per linear yard
 2. Fabric Weight: 3.1 oz. Per linear yard
 3. Vinyl Weight: 17.9 oz. Per linear yard
 4. Thickness: 0.018 to 0.026 in.
 5. Fabric: Poly-Cotton Woven
 6. Tensile (warpxfill): 50x55 lbs. Minimum
 7. Tear (warpxfill): 25x25 Minimum

2.03 ACCESSORIES

- A. Adhesives: Koroseal A-848-B Heavy-Duty Premixed vinyl adhesive.
- B. Substrate Primer/Sealer: White pigmented alkyd or acrylic/latex base primer specifically formulated for use with vinyl wallcoverings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and installation conditions.
- B. Test substrates with a suitable moisture meter and verify that moisture content does not exceed 4 percent.
- C. Verify substrate surfaces are clean, dry, smooth, structurally sound and free from surface defects and imperfections that would show through the finished surface.
- D. Evaluate all painted surfaces for the possibility of pigment bleed-through.
- E. Notify the contractor and architect in writing of any conditions detrimental to the proper and timely completion of the installation. Beginning of installation means acceptance of surface conditions.

3.02 INSTALLATION

- A. Allow wallcovering to acclimatize to the area of installation a minimum of 24 hours before installation.
- B. Before cutting, examine pattern and color and determine that they are the correct pattern and color as specified for the correct location.
- C. Read and follow the instructions in the manufacturer's installation sheet contained in each roll of the vinyl wallcovering.
- D. Use adhesive recommended by the wallcovering manufacturer.
- E. Install each roll in sequence starting from the highest to the lowest number and each strip in the same sequence as cut from the roll.
- F. Examine pattern for repeat design. Some patterns should be aligned, matched or reversed for best results. If necessary, trim selvage deep enough to assure color uniformity.
- G. Install wallcovering panels in exact order as they are cut from bolt, including pieces required to filling in above and below windows and above doors. Reverse alternate strips of non-matching patterns unless otherwise instructed.
- H. After the application of three strips, request inspection by the Architect/Designer. If there are variations in color or pattern that are considered to be excessive, notify the manufacturer's representative for an inspection before any further wallcovering is installed.
- I. Seam material at least 6 inches from inside and outside corners. Fit wallcovering into corners to avoid bridging or spanning. Horizontal seams are not permitted.
- J. Smooth wallcovering to the hanging surface using a stiff bristled sweep brush or a flexible broad-knife to eliminate air bubbles, wrinkles, gaps and overlaps.
- K. Remove excess adhesive along finished seams immediately after each wallcovering strip applied. Use clean warm water, a natural sponge and clean towels. Change water often to maintain water cleanliness.

3.03 CLEAN-UP COMPLETION

- A. Upon completion of the work, remove surplus materials, rubbish and debris resulting from the wallcovering installation. Leave areas in neat clean and orderly condition.

END OF SECTION 097200

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Steel.
 - 2. Galvanized metal.
- B. Related Requirements:
 - 1. Section 099123 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Coronado Paint, Benjamin Moore Company
 - 2. PPG Architectural Coatings.
 - 3. Sherwin-Williams Company (The)

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: As selected by Architect from manufacturer's full range.

2.3 METAL PRIMERS

- A. Primer, Alkyd, Anti-Corrosive for Metal: MPI #79.
 - 1. Sherwin-Williams (Basis of Design Kromik Universal Primer).

2.4 WATER-BASED PAINTS

A. Light Industrial Coating, Exterior, Water Based (Gloss Level 3): MPI #161.

1. Sherwin-Williams (Pro Industrial DTM Acrylic Eg Shel).

2.5 SOLVENT-BASED PAINTS

A. Alkyd, Exterior, Semi-Gloss (Gloss Level 5): MPI #94.

1. Sherwin Williams (Basis of Design DTM Alkyd Semi-Gloss).

2.6 BRICK STAIN

1. Basis-of-Design: Chemprobe:
 - a. Coat 1: Conformal Stain WB, Series 617.
 - b. Finish: Conformal Stain WB, Series 617.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.
 1. SSPC-SP 2, "Hand Tool Cleaning."

2. SSPC-SP 3, "Power Tool Cleaning."
 3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
 4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 4. Paint entire exposed surface of window frames and sashes.
 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following work where exposed to view:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Pipe hangers and supports.
 - d. Metal conduit.
 - e. Tanks that do not have factory-applied final finishes.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
 - 1. Water-Based Light Industrial Coating System:
 - a. Prime Coat: Primer, alkyd, anti-corrosive for metal, MPI #79.
 - b. Prime Coat: Shop primer specified in Section where substrate is specified.
 - c. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - d. Topcoat: Light industrial coating, exterior, water based (Gloss Level 3), MPI #161.
 - 2. Alkyd System:
 - a. Prime Coat: Primer, alkyd, anticorrosive for metal, MPI #79.
 - b. Prime Coat: Shop primer specified in Section where substrate is specified.
 - c. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - d. Topcoat: Alkyd, exterior, semi-gloss (Gloss Level 5), MPI #94.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates and staining and transparent finishing on wood substrates:
 - 1. Concrete.
 - 2. Concrete masonry units (CMU).
 - 3. Galvanized metal.
 - 4. Gypsum board.
- B. Related Requirements:
 - 1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
 - 2. Section 064100 "Architectural Wood Casework" for wood trim work to receive stains and clear finishing.
 - 3. Section 099113 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. PPG Architectural Coatings.
 - 3. Sherwin Williams Company (The)
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. Colors: As selected by Architect from manufacturer's full range.
- D. Prepare existing wood deck for new paint finish, to include removal of old paint by sanding, scraping or other means to remove existing finish and prepare for new paint. Warning! Exposure to lead dust or fumes may cause brain damage or other adverse health affects. Use proper protective equipment, such as a properly fitted respirator, and utilize proper containment and cleanup.
- 2.3 BLOCK FILLERS
- A. Block Filler, Latex, Interior/Exterior: MPI #4.
1. Sherwin Williams "Loxon Block Surfacer".
- 2.4 PRIMERS/SEALERS
- A. Primer Sealer, Latex, Interior: MPI #50.
1. Sherwin Williams "Drywall Primer".
- B. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.
1. Sherwin Williams "Premium Wall & Wood Primer".
- 2.5 METAL PRIMERS
- A. Primer, Rust-Inhibitive, Water Based: MPI #107.
1. Sherwin Williams "Pro Industrial Pro-Cryl Universal Primer".
- 2.6 WATER-BASED PAINTS
- A. Latex, Interior, (Gloss Level 3): MPI #52.
1. Sherwin Williams "Pro Mar 200 Zero Interior Latex Eg-Shel".
- 2.7 SOLVENT-BASED PAINTS
- A. Alkyd, Interior, Semi-Gloss (Gloss Level 5): MPI #47.
1. Sherwin Williams "Pro Mar 200 Alkyd Semi-Gloss".
- 2.8 DRY FOG/FALL COATINGS
- A. Dry Fall, Latex, Flat: MPI #118.
1. Sherwin Williams (Basis of Design Pro Industrial Waterborne Arcylic Dryfall).

2.9 FLOOR COATINGS

A. Sealer, Solvent Based, for Concrete Floors: MPI #104.

1. Sherwin Williams "H & C Decorative Concrete Sealer".

2.10 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.
 2. Masonry (Clay and CMU): 12 percent.
 3. Wood: 15 percent.
 4. Gypsum Board: 12 percent.
 5. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.
- F. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- G. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

- A. Wood substrates, nontraffic surfaces, including wood trim.
 - 1. Polyurethane Varnish System:
 - a. Prime Coat: Polyurethane varnish matching topcoat.
 - b. Intermediate Coat: Polyurethane varnish matching topcoat.
 - c. Topcoat: Varnish, interior, polyurethane, oil-modified, gloss (Gloss Level 6).

END OF SECTION 099123

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Visual display board assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
- B. Shop Drawings: For visual display units.
 - 1. Include plans, elevations, sections, details, and attachment to other work.
 - 2. Show locations of panel joints.
 - 3. Include sections of typical trim members.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For visual display units to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and

temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.
 - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 VISUAL DISPLAY BOARD ASSEMBLY.

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Claridge Products and Equipment, Inc.
 - 2. Marsh Industries, Inc.
 - 3. Nelson Adams NACO
- B. Visual Display Board Assembly: factory fabricated.
 - 1. Assembly: markerboard and tackboard.
 - 2. Corners: Square.
 - 3. Width: As indicated on Drawings.
 - 4. Height: As indicated on Drawings.
 - 5. Mounting Method: Direct to wall.
- C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.
 - 1. Color: White.
- D. Tackboard Panel: Vinyl-fabric-faced tackboard panel on core indicated.
 - 1. Fabric Wrapped Edge: Wrap edge of tackboard panel with fabric facing.
 - 2. Color and Pattern: As selected by Architect from full range of industry colors.

- E. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-(1.57-mm-)thick, extruded aluminum; standard size and shape.
 - 1. Aluminum Finish: Clear anodic finish.
- F. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
- G. Combination Assemblies: Provide H-trim between abutting sections of visual display panels.
- H. Chalktray/ Marker Tray: Manufacturer's standard; continuous.
 - 1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
- I. Display Rail: Manufacturer's standard, extruded-aluminum display rail with insert, end stops, and continuous paper holder, designed to hold accessories.
 - 1. Size: 1 inch (25 mm) high by full length of visual display unit.
 - 2. Map Hooks: Two map hooks for every 48 inches (1200 mm) of display rail or fraction thereof.
 - 3. Map Hooks and Clips: Two map hooks with flexible metal clips for every 48 inches (1200 mm) of display rail or fraction thereof.
 - 4. Flag Holder: One for each room.
 - 5. Aluminum Color: Match finish of visual display assembly trim.

2.4 MARKERBOARD PANELS

- A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.
 - 1. Face Sheet Thickness: 0.021 inch (0.53 mm) uncoated base metal thickness.
 - 2. Particleboard Core: 3/8 inch (9.5 mm) thick; with 0.015-inch-(0.38-mm-)thick, aluminum sheet backing.
 - 3. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.
 - 4. Backing Sheet: Steel backing.

2.5 TACKBOARD PANELS

- A. Tackboard Panels:
 - 1. Facing: 1/4-inch-(6-mm-) thick.
 - 2. Facing: Vinyl fabric.
 - 3. Core: 3/8-inch-(9.5-mm-) thick fiberboard.

2.6 MATERIALS

- A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

- B. Vinyl Fabric: Mildew resistant, washable, complying with FS CCC-W-408D, Type II, burlap weave; weighing not less than 13 oz./sq. yd. (440 g/sq. m); with surface-burning characteristics indicated.
- C. Polyester Fabric: Nondirectional weave, 100 percent polyester; weighing not less than 15 oz./sq. yd. (508 g/sq. m); with surface-burning characteristics indicated.
- D. Hardboard: ANSI A135.4, tempered.
- E. Particleboard: ANSI A208.1, Grade M-1.
- F. Medium-Density Fiberboard: ANSI A208.2.
- G. Fiberboard: ASTM C 208 cellulosic fiber insulating board.
- H. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.
- I. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603, except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

- B. Examine walls and partitions for proper preparation and backing for visual display units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.

3.3 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Factory-Fabricated Visual Display Board Assemblies: Adhere to wall surfaces with egg-size adhesive gobs at 16 inches (400 mm) o.c., horizontally and vertically.
- C. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches (400 mm) o.c. Secure tops and bottoms of boards to walls.
- D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated below.
 - 1. Mounting Height for Grades K through 3: 24 inches (610 mm) above finished floor to top of marker tray.
 - 2. Mounting Height for Grades 4 through 6: 28 inches (711 mm) above finished floor to top of marker tray.
 - 3. Mounting Height for Grades 7 and Higher: 36 inches (914 mm) above finished floor to top of marker tray.

3.4 CLEANING AND PROTECTION

- A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100

SECTION 101416 - PLAQUES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes plaques.
- B. Related Requirements:
 - 1. Section 101423 "Panel Signage" for signs, with or without frames, that are made of materials other than solid metal.
 - 2. Section 101419 "Dimensional Signage" for dimensional letters.

1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of plaque, exposed component, and exposed finish.
- C. Plaque Schedule: Use same designations specified or indicated on Drawings or in a plaque or sign schedule.
 - 1. Content of sign is to be determined at a later date. Request plaque information from School District through Sherman Carter Barnhart Architects, PLLC at least 2 months prior to fabrication.
 - 2. Submit for approval by School Board through Sherman Carter Barnhart Architects, PLLC prior to fabrication.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for signs.

2.2 PLAQUES

- A. Cast Plaque: Plaque with background texture, border, and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Andco Industries Corp.
 - b. ARK Ramos Manufacturing Company, Inc.
 - c. Best Sign Systems, Inc.
 - d. Fast Signs
 - e. Nelson Harkins
 - f. Grandview Aluminum Products, Inc.
 - g. Mills Manufacturing
 - 2. Plaque Material: Cast aluminum.
 - 3. Plaque Thickness: 0.50 inch (12.7 mm).
 - 4. Finishes:
 - a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.
 - 5. Background Texture: Pebble.
 - 6. Integrally Cast Border Style: Double-raised line border.
 - 7. Mounting: Mount plaques using the standard method recommended by the manufacturer for the type of wall surface indicated.

2.3 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by plaque manufacturer for casting process used and for type of use and finish indicated.
- B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of plaques, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. Exposed Metal-Fastener Components, General:

- a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.

2.5 FABRICATION

- A. General: Provide manufacturer's standard plaques according to requirements indicated.
 - 1. Preassemble plaques in the shop to greatest extent possible. Disassemble plaques only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 5. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match plaque finish.
 - 6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of plaque work.

- B. Verify that plaque-support surfaces are within tolerances to accommodate plaques without gaps or irregularities between backs of plaques and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install plaques using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
 - 2. Install plaques so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
 - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed plaques and plaques that do not comply with specified requirements. Replace plaques with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as plaques are installed.
- C. On completion of installation, clean exposed surfaces of plaques according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain plaques in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101416

SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fabricated channel dimensional characters.
 - 2. Vinyl Exterior Lettering/ Numbering

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- C. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior fabricated channel dimensional characters, allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 VINYL LETTERING SIGNAGE

- A. Cut vinyl lettering rated for exterior use. Size and locations as indicated on drawings.
- B. Mounting: removable surface mount on glass.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers listed in this specification section 2.3.A.1.

- D. Color: As selected by Architect from Manufacturers full range of standard colors.

2.3 DIMENSIONAL CHARACTERS

- A. Fabricated Channel Characters.. Metal face and side returns, formed free from warp and distortion; with uniform faces, sharp corners, and precisely formed lines and profiles; internally braced for stability and for securing fasteners; and as follows.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Andco Industries, Corp.
 - b. ASI Sign Systems, Inc.
 - c. Fast Signs
 - d. Best Sign Systems, Inc.
 - e. Contemporary Plastics, Inc.
 - f. Nelson Harkins
 - g. ARK Ramos Manufacturing Company, Inc.
 - h. Mills Manufacturing
 - 2. Character Material: Sheet or plate aluminum.
 - 3. Material Thickness: 1/4".
 - 4. Character Height: As indicated on drawings..
 - 5. Character Depth: 1".
 - 6. Finishes:
 - a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.
 - 7. Mounting: Concealed, stainless-steel back bar or bracket assembly.
 - a. Hold characters flush to wall surface.

2.4 DIMENSIONAL CHARACTER MATERIALS

- A. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.5 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.

2.6 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly

- mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 5. Internally brace signs for stability and for securing fasteners.
 6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.7 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.8 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

SECTION 101423 - PANEL SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Panel signs.
 - 2. Room-identification signs.
- B. Related Requirements:

1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For panel signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for signs.

2.2 SIGNS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Best Sign Systems, Inc.
 2. Mohawk Sign Systems, Inc.
 3. Seton Identification Products
 4. ASI Sign Systems, Inc.
 5. Contemporary Plastics, Inc.
 6. Johnson Signs, Inc.
 7. Fast Signs
 8. Mills Manufacturing

9. Innerface
10. Dura Architectural Signage
11. Nelson Harkins
12. Cornerstone Signs
13. Signs International, Inc.
14. American Graphics, Inc.

B. Panel Sign.: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Basis-of-Design Product: ASI InTac.
2. Solid-Sheet Sign, Returns, and Back: Acrylic sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph below and as follows:
 - a. Thickness: 0.125 inch (3.18 mm).
 - b. Surface-Applied Graphics: Raised 1/32". text and graphics.
 - 1) Text: Font Helvetica Regular to meet ADA requirements.
 - 2) Inset, Cutout Characters: Sign face routed to receive push-through acrylic graphics to project 1/32" from the sign panel.
 - c. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.
 - d. Mounting: Concealed fasteners and adhesive unless noted otherwise on drawings.
3. Mounting: Surface mounted to wall with concealed anchors.
4. Surface Finish and Applied Graphics:
 - a. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in color as selected by Architect from manufacturer's full range.
 - b. Overcoat: Manufacturer's standard baked-on clear coating.
5. Text and Typeface: Accessible raised characters and Braille and Helvetica Regular. Finish raised characters to contrast with background color, and finish Braille to match background color.
6. Flatness Tolerance: Sign panel shall remain flat or uniformly curved under installed conditions as indicated and within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner.

2.3 PANEL-SIGN MATERIALS

- A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- B. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.
- C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
 - 3. Inserts: Furnish inserts to be set by other trades into concrete or masonry work.

2.5 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. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 5. Internally brace signs for stability and for securing fasteners.
 - 6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.
- C. Subsurface-Engraved Graphics: Reverse engrave back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.
- D. Shop- and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.
- E. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
 - 1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.
 - 2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.

3. For frame to hold changeable sign panel, fabricate frame without burrs or constrictions that inhibit function. Furnish initial sign panel. Subsequent changeable sign panels are by Owner.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls according to accessibility standard.
- C. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423

SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Corner guards.
- B. Related Sections:
 - 1. Section 087100 "Door Hardware" for metal armor, kick, mop, and push plates.
 - 2. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for surface-mounted corner guards.

1.3 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.
- B. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: For each type of impact-resistant wall protection unit indicated.
 - 1. Include similar Samples of accent strips and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below. Include Samples of accent strips to verify color selected.
 - 1. Corner Guards: 12 inches (300 mm) long. Include examples of joinery, corners, top caps, and field splices.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Test Reports: For each impact-resistant plastic material.
- B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.6 MATERIALS MAINTENANCE SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. 2 percent of each type, color, and texture of units installed, but no fewer than two, 8-foot-(2.4-m-) long units.
 - 2. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two, 4-foot-(1.2-m-) long units.
- B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Section 014000 "Quality Requirements."
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.
- E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.

2. Keep plastic sheet material out of direct sunlight.
3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).
 - a. Store corner-guard covers in a vertical position.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of plastic and other materials beyond normal use.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; extruded material, thickness as indicated.
 1. Impact Resistance: Minimum 25.4 ft-lbf/in. (1356 J/m) of notch when tested according to ASTM D 256, Test Method A.
 2. Chemical and Stain Resistance: Tested according to ASTM D 543.
 3. Self-extinguishing when tested according to ASTM D 635.
 4. Flame-Spread Index: 25 or less.
 5. Smoke-Developed Index: 450 or less.
- B. Polycarbonate Plastic Sheet: ASTM D 6098, S-PC01, Class 1 or 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft-lbf/in. (800 J/m) of notch when tested according to ASTM D 256, Test Method A.
- C. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in ASTM B 221 (ASTM B 221M) for Alloy 6063-T5.
- D. Stainless-Steel Sheet: ASTM A 240/A 240M.
- E. Brass: ASTM B 249/B 249M for extruded shapes and ASTM B 36/B 36 M for sheet.
- F. Particleboard: ANSI A208.1, Grade M-2.

- G. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

2.2 CORNER GUARDS

- A. Surface-Mounted, Resilient, Plastic Corner Guards.: Assembly consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BALCO, Inc., Type CGS-3 or approved equal.
 - b. Pawling Corporation
 - c. Construction Specialties (www.c-sgroup.com)
 - 2. Cover: Extruded rigid plastic, minimum 0.078-inch (2.0-mm) wall thickness; as follows:
 - a. Profile: Nominal 2-inch-(50-mm-)long leg and 1/4-inch (6-mm) corner radius.
 - b. Height: Top of guard shall be at 7'-4" above finish floor and terminate at top of resilient base..
 - c. Color and Texture: As selected by Architect from manufacturer's full range.
 - 3. Retainer: Minimum 0.060-inch-(1.5-mm-)thick, one-piece, extruded aluminum.
 - 4. Retainer Clips: Manufacturer's standard impact-absorbing clips.
 - 5. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

2.3 FABRICATION

- A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
- B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.
- D. Miter corners and ends of wood handrails for returns.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.

- B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
 - 1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings or, if not indicated, at heights indicated below:
 - a. Top of corner guard shall be at 7'-4" above finish floor and terminate at the top of resilient base..
 - 2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
 - a. Provide anchoring devices to withstand imposed loads.
 - b. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (305 mm).
 - c. Adjust top caps as required to ensure tight seams.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Public-use shower room accessories.
 - 3. Warm-air dryers.
 - 4. Custodial accessories.
- B. Owner-Furnished, Contractor Installed Material: Soap Dispensers, Toilet Paper Dispensers, Sanitary Napkin Disposals, Paper Towel Dispensers, and Changing Tables. Refer to Enlarged Plans and Toilet Accessory Schedule.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.7 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Grab Bar.:

1. Basis-of-Design Product: Refer to Toilet Accessory Schedule in Drawings..
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
 - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/4 inches (32 mm).
5. Configuration and Length: As indicated on Drawings.

C. Mirror Unit.:

1. Basis-of-Design Product: Refer to Toilet Accessory Schedule in Drawings..
2. Frame: Stainless-steel angle, 0.05 inch (1.3 mm) thick.
 - a. Corners: Welded and ground smooth.
3. Integral Shelf: 5 inches (127 mm) deep.
4. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
5. Size: As indicated on Drawings.

2.3 PUBLIC-USE SHOWER ROOM ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Shower Curtain Rod.:
 1. Basis-of-Design Product: Refer to Toilet Accessory Schedule in Drawings..
 2. Description: 1-1/4-inch (32-mm) OD; fabricated from nominal 0.05-inch-(1.3-mm-)thick stainless steel.
 3. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
 4. Finish: No. 4 (satin).
- C. Shower Curtain.:
 1. Basis-of-Design Product: Refer to Toilet Accessory Schedule in Drawings..
 2. Size: Minimum 12 inches (305 mm) wider than opening by 72 inches (1828 mm) high.
 3. Material: Nylon-reinforced vinyl, minimum 10 oz. (284 g) or 0.008-inch-(0.2-mm-)thick vinyl, with integral antibacterial agent.
 4. Color: As selected from manufacturer's full range.
 5. Grommets: Corrosion resistant at minimum 6 inches (152 mm) o.c. through top hem.
 6. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.
- D. Folding Shower Seat.:
 1. Basis-of-Design Product: Refer to Toilet Accessory Schedule in Drawings..

2. Configuration: L-shaped seat, designed for wheelchair access.
3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.
4. Mounting Mechanism: Stainless steel, No. 4 finish (satin).
5. Dimensions: 33" wide by 23" deep..

2.4 CUSTODIAL ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Mop and Broom Holder.:
 1. Basis-of-Design Product: Refer to Toilet Accessory Schedule in Drawings..
 2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
 3. Length: 36 inches (914 mm).
 4. Hooks: 5.
 5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
 6. Material and Finish: Stainless steel, No.4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch-(1.3-mm-)thick stainless steel.
 - b. Rod: Approximately 1/4-inch-(6-mm-)diameter stainless steel.

2.5 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. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.
- B. Related Requirements:
 - 1. Section 104416 "Fire Extinguishers."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Samples for Initial Selection: For each type of exposed finish required.

1.4 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.5 SEQUENCING

- A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.

- B. Cabinet Construction: Nonrated.
- C. Cabinet Material: Cold-rolled steel sheet.
- D. Semi-recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - 1. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.
- E. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.
- F. Cabinet Trim Material: Same material and finish as door.
- G. Door Material: Steel sheet.
- H. Door Style: Fully glazed panel with frame.
- I. Door Glazing: Tempered float glass (clear).
- J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide projecting door pull and friction latch.
 - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- K. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
 - 3. Door Lock: Cylinder lock, keyed alike to other cabinets.
 - 4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
 - a. Identify fire extinguisher in fire-protection cabinet with the words " FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Silk-screened.
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.
- L. Materials:
 - 1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel or powder coat.
 - b. Color: As selected by Architect from full range of industry colors and color densities.
 - 2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.2 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 - 1. Weld joints and grind smooth.
 - 2. Provide factory-drilled mounting holes.
 - 3. Prepare doors and frames to receive locks.
 - 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
 - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
 - 2. Fabricate door frames of one-piece construction with edges flanged.
 - 3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.3 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 - 1. Fire-Protection Cabinets: 54 inches (1372 mm) above finished floor to top of cabinet.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semi-recessed fire-protection cabinets.
 - 2. Provide inside latch and lock for break-glass panels.
 - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- C. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.
- B. Related Requirements:
 - 1. Section 104413 "Fire Protection Cabinets."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.4 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- B. Multipurpose Dry-Chemical Type in Steel Container FE: UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS.

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: 54 inches (1372 mm) above finished floor to top of fire extinguisher.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 105300 - ALUMINUM PROTECTIVE CANOPIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of work includes all labor, material, equipment and related items required for the installation of "Aluminum Protective Canopies" as shown on the drawings and specified herein.

1.3 QUALITY ASSURANCE:

- A. Materials and finishes shall meet or exceed recommended ASTM, Military and Federal Test methods specified by the Aluminum Association in their publication "Aluminum Standards and Data, current edition.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's product data and installation instructions for each type of canopy specified.
- B. Samples for Initial Color Selection: Manufacturer's color charts showing a full range of available colors.
- C. Samples for Color Verification: Sample showing actual colors prepared on same material to be used for the work.
- D. Shop Drawings: Submit shop drawings for components and installation which are fully dimensioned or detailed on manufacturer's data sheets.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with requirements, provide products of one of the following or approved equal:
 - 1. Alcan Aluminum Canopies
 - 2. Mapes Industries, Inc.
 - 3. E.L. Burns Company, Inc.
 - 4. American Aluminum Products Company.
 - 5. Perfection Metal and Supply Company.
 - 6. Peach Tree Protective Covers
 - 7. Superior
 - 8. Tennessee Valley Metals

2.2 CONSTRUCTION:

- A. Door Canopy: Louver leaves shall be .075" minimum walled aluminum with a three-inch minimum rib height, flush deck. Fascia gutter shall be a structural 7" minimum .094 walled extruded tube. Two-piece fascia shall not be accepted. Overhead supports shall be a heavy-duty extruded prefinished tube aluminum strut supports, minimum deck rib height to be 3".

Galvanized steel struts will not be accepted. Downspouts to be galvanized steel: 22 gauge. Provide galvanized metal strainers at the highest end of all downspouts. Provide 16 ga galvanized steel downspout straps 1" x 2" at downspouts, Finish shall be factory applied 70% by weight Kynar resin in a custom color as selected by owner.

2.3 PROTECTIVE COATING:

- A. All ferrous fasteners and hanging accessories shall be heavily galvanized or cadmium plated. All louvers, gutters and fascia to be caustic etched and alumilited.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install canopies at locations shown in accordance with enlarged details and manufacturer's instructions for plumb, level, rigid and flush installation.

END OF SECTION 105300

SECTION 107500 - FLAGPOLES

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 ground-mounted flagpoles made from aluminum and steel.
- B. Owner-Furnished Material: Flags.
- C. Related Sections:
 - 1. Division 07 Sections for base flashing at roof-mounted flagpoles.
 - 2. Division 07 Section "Sheet Metal Flashing and Trim" for counterflashing flashing at roof-mounted flagpoles.
 - 3. Division 26 Section "Lightning Protection for Structures" for connecting wall- and roof-mounted metal flagpoles to lightning protection system.
 - 4. Division 26 Section "Exterior Lighting" for site lighting fixtures.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:
 - 1. Wind Loads: Sustained winds of 211 mph according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles".
 - 2. Base flagpole design on polyester, nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.
- B. Shop Drawings: For flagpoles. Include plans, elevations, details, and attachments to other work. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support signed and stamped by a licensed KY Structural Engineer.
 - 1. Include section, and details of foundation system for ground-mounted flagpoles.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

- D. Delegated-Design Submittal: For flagpole assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Qualification Data: For qualified professional engineer.
- F. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain flagpole as complete unit, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.
- B. Installer Qualifications:
 - 1. Five years minimum experience installing flagpoles of similar height and complexity of project.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Keep flagpole and accessories covered and dry to prevent soiling or damage.
- D. Handle with protective glove to prevent unwanted distortion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Flagpole Warehouse, 3600 Cantrell Industrial Ct., Acworth, GA 30101. (800) 962-0956, Fax (770) 974-4560. Email: flagpoles@flagco.com, Web: www.flagpolewarehouse.com
 - 2. or Equivalent.

2.2 FLAGPOLES

- A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
 - 1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
 - 2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
 - 3. Provide self-aligning, snug-fitting joints.

- B. Exposed Height: (1) one at 30 feet (9 m).
- C. Aluminum Flagpoles: Provide cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm). Illuminator architectural series internal halyard flagpole model ILIH30V by Flagpole Warehouse, basis of design.
- D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, not less than 0.064-inch- (1.6-mm-) nominal wall thickness. Provide with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch- (19-mm-) diameter, steel ground spike; and steel centering wedges welded together. Galvanize steel after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.
 - 1. Provide flashing collar of same material and finish as flagpole.
 - 2. Provide steel ground protectors extending 12 inches (300 mm) aboveground and 6 inches (150 mm) belowground for steel flagpoles where flashing collars are not provided.
- E. Sleeve for Aluminum Flagpole: Fiberglass or PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.
 - 1. Provide flashing collar of same material and finish as flagpole.
- F. Cast-Metal Shoe Base: For anchor-bolt mounting; provide with anchor bolts.
 - 1. Provide units made from steel with same finish and color as flagpoles.
 - 2. Provide ground spike at grade-mounted flagpoles.
 - 3. Provide connector to building's lightning protection system conductor at roof-mounted flagpoles.
- G. Hinged Baseplate: Cast-metal tilting hinged base and anchored plate joined by permanently secured pivot rod. Provide with stainless-steel screws for securing tilting base to anchored plate when not tilted; provide with anchor bolts.
 - 1. Finish base to match flagpole.
 - 2. Provide aluminum base or aluminum flashing collar finished to match flagpole.
 - 3. Provide ground spike at grade-mounted flagpoles.
 - 4. Provide connector to building's lightning protection system conductor at roof-mounted metal flagpoles.

2.3 FITTINGS

- A. Gold anodized aluminum ball ornament: Internal halyard cam system beacon with 110V LED bulbs (6 watt), sized as indicated or, if not indicated, to match flagpole-butt diameter. Flagpole warehouse, basis of design.
- B. Internal Halyard. Cast aluminum revolving truck with pulley. Finish truck assembly to match flagpole.
 - 1. Halyard Flag Snaps: Provide two bronze swivel snap hooks per halyard.
 - a. Provide with neoprene or vinyl covers.

2.4 MISCELLANEOUS MATERIALS

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.
- B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.
- C. Sand: ASTM C 33, fine aggregate.
- D. Elastomeric Joint Sealant: Multicomponent nonsag urethane joint sealant complying with requirements in Division 07 Section "Joint Sealants" for Use NT (nontraffic) and for Use M, G, A, and, as applicable to joint substrates indicated, for Use O.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including foundation; accurate placement, pattern, orientation of anchor bolts, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.
- B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.
- C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.

- D. Place concrete, as specified in Division 03 Section "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use nonstaining curing compound.
- E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.3 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.
- B. Ground Set: Place foundation tube, sleeve, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure. Install flagpole, plumb, in foundation tube.
 - 1. Foundation Tube: Place tube seated on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.
- C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.
- D. Mounting Brackets and Bases: Anchor brackets and bases securely through to structural support with fasteners as indicated on Shop Drawings.
- E. Flagpole must be plumb.

END OF SECTION 10750

SECTION 116623 - GYMNASIUM EQUIPMENT

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. Basketball equipment.
- 2. Volleyball equipment.
- 3. Safety pads.

- B. Related Requirements:

- 1. Section 033000 "Cast-in-Place Concrete" for installation of floor insert sleeves to be cored into existing floor slab.
- 2. Section 096466 "Wood Athletic Flooring" for game lines and markers.
- 3. Section 116653 "Gymnasium Dividers."

1.3 DEFINITIONS

- A. FIBA: Federation Internationale de Basketball Amateur (The International Basketball Federation).
- B. FIVB: Federation Internationale de Volleyball (The International Volleyball Federation).
- C. NCAA: The National Collegiate Athletic Association.
- D. NFHS: National Federation of State High School Associations.
- E. USAV: USA Volleyball.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. If applicable, include assembly, disassembly, and storage instructions for removable equipment.
- 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

- B. Shop Drawings: For gymnasium equipment.

- 1. Include plans, elevations, sections, details, and attachments to other work.

2. Include details of field assembly for removable equipment, connections, installation, mountings, floor inserts, attachments to other work, and operational clearances.
3. Include transport and storage accessories for removable equipment.

C. Samples for Initial Selection: For each type of gymnasium equipment.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of gymnasium equipment.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium equipment to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

1.9 COORDINATION

- A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.
- B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension-system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Basketball backboard failures including glass breakage.
 - b. Faulty operation of basketball backstops.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain gymnasium equipment from single source from single manufacturer.

2.2 BASKETBALL EQUIPMENT

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Porter Athletics, Basis of Design or comparable product by one of the following:
 1. AALCO Manufacturing.
 2. Draper Inc.
 3. Performance Sports Systems.
 4. Porter Athletic Equipment Company.
- B. General: Provide equipment complying with requirements in NFHS's "NFHS Basketball Rules Book."
- C. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.
- D. Provide manufacturer's recommended connections complying with Section 055000 "Metal Fabrications" of size and type required to transfer loads to building structure.
- E. Overhead-Supported Forward Folding Backstops: (Basis of Design Porter No. 949 Center-Strut)
 1. Folding Type: Provide manufacturer's standard assembly for forward-folding, front-braced backstop, with hardware and fittings to permit folding.
 2. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.
 - a. Center-Mast Frame: Welded and bolted or clamped with side sway bracing.
 - b. Finish: Manufacturer's standard polyester powder-coat finish.
 3. Goal Height Adjuster: Adjustable from 8 to 10 feet (2.4 to 3 m) with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.
 - a. Operation: Electric with integral gear-drive motor, with limit switches preset to goal heights and the following:
 - 1) Key switch control located where selected by owner for ease of use.
- F. Backstop Safety Device: Designed to limit free fall if support cable, chains, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; 6000-lb (2722-kg) load capacity; one per folding backstop.
 1. Retractor Device: Manufacturer's standard device designed to retract both support and safety cables, chains, and straps away from play of the basketball when backstop is in playing position; one per folding backstop.

- G. Winch: Hoist, consisting of heavy-duty, fully enclosed worm-gear; brake; cable drum; cable; and fittings, for mounting on location coordinated with owner; designed to move and hold backboard in any raised or lowered position.
 - 1. Operation: Electric wench with Key Switch Control.

- H. Backstop Electric Operator: Provide operating machine of size and capacity recommended by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.
 - 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Operator Type: Cable drum with grooved drum and cable tension device to automatically take up cable slack and retain cable in grooves.
 - 3. Operator Mounting: Install per Owner/ Architect's direction.
 - 4. Motor Electrical Characteristics:
 - a. Voltage: 115V.
 - b. Horsepower: 1/2 hp.
 - c. Phase: Single.
 - 5. Remote-Control Station(s): NEMA ICS 6, Type 1 enclosure for surface mounting and momentary-contact, three-position, switch-operated control with up, down, and off functions.
 - a. Group Key Switch Control Stations: One switch per each backstop.
 - b. Keys: Provide one key per station.
 - c. Switches, Ganged: Single faceplate with multiple switch cut-outs for three switches operating six backstops.
 - d. Control Station Enclosure: Provide prime-painted metal enclosure with key access with two sets of keys per enclosure.
 - 6. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop basketball equipment at fully retracted and fully lowered positions.

- I. Basketball Backboards:
 - 1. Shape and Size:
 - a. Rectangular, 72 by 48 inches (1800 by 1200 mm) width by height.
 - 2. Backboard Material: With predrilled holes or preset inserts for mounting goals, and as follows:
 - a. Glass: Not less than 1/2-inch-(13-mm-) thick, transparent tempered glass complying with ASTM C 1048 Kind FT (fully tempered) and with impact testing requirements in 16 CFR 1201 Category II or ANSI Z97.1 Class A for safety glazing. Provide glass and framing system manufactured to comply with FIBA Level 1 or Level 2 requirement that glass does not split off if broken. Provide glass with impact-absorbing resilient rubber or PVC gasket around perimeter in a fully welded, brushed-natural-finish, extruded-aluminum frame, with steel subframe, reinforcement, bracing, and mounting slots for mounting backboard frame to backboard support framing.

- 1) Standard Mount: Provide steel corner reinforcement with mounting slots for mounting backboard frame to backstop at standard mounting centers. Provide center-strut frame reinforcement.
 - 2) Rim-Restraining Device: Complying with NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.
3. Target Area and Border Markings: Permanently etched in white color, marked in pattern and stripe width according to referenced rules.
 4. Target Area and Border Markings: Marked in pattern, stripe width, and color according to referenced rules.
 5. Finish: Manufacturer's standard factory-applied, white background.
- J. Goal Mounting Assembly: Compatible with goal, backboard, and support framing; with hole pattern 5 inches (127 mm) o.c. horizontally and 4 inches (102 mm) o.c. vertically for goal attachment.
1. Glass Backboard Goal Mounting Assembly: Goal support framing and reinforcement designed to transmit load from goal to backboard frame and to minimize stresses on glass backboard.
 2. Direct Mount: Designed for mounting goal directly and independently to center mast of backboard support framing so no force, transmitted by ring, is directly applied to backboard, and rigidity and stability of goal are maximized.
- K. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication complying with referenced rules.
 2. Breakaway Characteristics: Positive-lock movable breakaway design, with manufacturer's standard breakaway mechanism including preset pressure release, set to release at 230-lb (105-kg) load, and automatic reset. Provide movable ring with rebound characteristics identical to those of fixed, nonmovable ring.
 3. Field Adjustment: Provide rim that is field-adjustable for rebound elasticity without being removed from the backboard.
 4. Mount: Rear.
 5. Net Attachment: No-tie loops for attaching net to rim without tying.
 6. Finish: Manufacturer's standard finish.
- L. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches (380 to 460 mm) long, sized to fit rim diameter, and as follows:
1. Competition Cord: Anti-whip, made from white nylon cord not less than 120-gm thread and not more than 144-gm thread.
- M. Backboard Safety Pads: Designed for backboard thickness indicated and extending continuously along bottom and up sides of backboard and over goal mounting and backboard supports as required by referenced rules.
1. Attachment: Manufacturer's standard.
 2. Color: As selected by Architect from manufacturer's full range.

2.3 VOLLEYBALL EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. General: Provide equipment complying with requirements in NFHS's "NFHS Volleyball Rules Book."
- C. Floor Insert: Solid-brass floor plate; and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, not less than 9 inches (228 mm) long to securely anchor pipe sleeve below finished floor in concrete footing; with anchors designed for securing floor insert to floor substrate indicated; quantity as indicated.
 - 1. Floor Plate: Lockable, hinged access cover, designed to be flush with adjacent flooring. Provide two tool(s) for unlocking access covers.
- D. Post Standards: Removable, paired volleyball post standards as indicated. Adjustable, telescoping height. Designed for easy removal from permanently placed floor insert supports. Fabricated from extruded-aluminum pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring. Finished with manufacturer's standard factory-applied, polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness or plated metal finish.
 - 1. Nominal Pipe or Tubing Diameter: 3-1/2-inch (89-mm) OD at base.
 - 2. Telescopic and Net Height Adjuster System: Provide infinitely adjustable system consisting of screw rod, gear, and crank or constant-tension spring and pulley assist and locking device, telescopic post, and fittings for holding net at selected height; designed for height adjustment of post standard to position net at heights indicated.
 - a. Net Heights: Between tennis net height and boys'/men's volleyball net height, 42 and 95-5/8 inches (1067 and 2430 mm) or more.
 - 3. Height Markers: Clearly marked at regulation play heights for boys/men.
- E. Net: 32 feet (9.75 m) long; one per pair of paired post standards; and as follows:
 - 1. Width and Mesh: Competition volleyball net, 39 inches (990 mm) with 4-inch-(102-mm-) square knotless mesh made of black nylon string.
 - a. Hem Band Edges: White, not less than 2-inch-(50-mm-)wide top, bottom, and side bindings; tie offs at top, bottom, and midpoint of each side end of net; end sleeves for dowels; and lines with linkage fittings threaded through top and bottom hems of binding. Provide lengths of lines and linkage fittings as required to properly connect to and set up net for post standard spacing indicated on Drawings.
 - 1) Top Line: Not less than 1/8-inch-(3-mm-)diameter, galvanized- or coated-steel cable.
 - 2) Bottom Line: Not less than 1/8-inch-(3-mm-)diameter, galvanized- or coated-steel cable.
 - 2. Dowels: Not less than 1/2-inch-(13-mm-)diameter fiberglass or 1-inch-(25-mm-)diameter wood. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.

3. Net Antennas: 3/8-inch-(9.5-mm-)diameter, high-tensile-strength, extruded-fiberglass or plastic rods, 72 inches (1800 mm) long, extending above top hem band of net, with alternating white and red bands according to competition rules. Provide two antennas per net.
 - a. Clamps: Designed to secure antenna to top and bottom of net.
 4. Boundary Tape Markers: 2-inch-(50-mm-) wide white strip with sleeve for securing net antenna, secured to net top and bottom with hook-and-loop attachment. Provide two tape markers per net for marking court boundaries.
- F. Net-Tensioning System: Designed to adjust and hold tension of net. Fully enclosed, nonslip ratchet-type winch with cable length and fittings for connecting to net lines, positive-release mechanism, and removable handle. Mount net tensioner on post standard at side away from court. Provide end post with post top pulley. Provide opposing post with welded-steel loops, hooks, pins, or other devices for net attachment and post top grooved line guide.
- G. Bottom Net Lock Tightener: Provide manufacturer's standard quick-release-type tension strap; a spring-loaded, self-locking tensioner; a turnbuckle; a pulley; or other device and linkage fittings designed to quickly and easily tighten bottom line or net.
- H. Judges' Stands: Provide manufacturer's standard adjustable-height units designed to be freestanding, folding for storage with wheels for transporting. Fabricate welded-steel tubing units with finish and color to match post standards.
- I. Safety Pads: Comply with NCAA and NFHS requirements. Provide pads consisting of not less than 1-1/4-inch-(32-mm-)thick, multiple-impact-resistant manufacturer's standard foam filler covered by puncture- and tear-resistant fabric cover, not less than 14-oz./sq. yd. (475-g/sq. m) PVC-coated polyester, treated with fungicide for mildew resistance; with fire-test-response characteristics indicated, and lined with fire-retardant liner. Provide pads with hook-and-loop closure or attachments for the following components:
1. Post Standards: Wraparound style, designed to totally enclose each standard to a height of not less than 72 inches (1800 mm); one per post.
 2. Net Lines: Four per net.
 3. Judges' Stands: Designed to totally enclose each unit.
 4. Fabric Cover Flame-Resistance Ratings: Complies with NFPA 701.
 5. Fabric Color: As selected by Architect from full range of industry standard colors and color densities.
 6. Graphics: Custom graphics as indicated.
- J. Post Standard Transporter: Manufacturer's standard wheeled unit designed for transporting a single post.
- K. Wall Storage Rack: Manufacturer's standard unit designed for mounting on walls and for storing post standards in vertical position with retaining arms, fittings for padlock, and mounting hardware; number of units as required to provide storage for specified equipment.
- L. Storage Cart: Manufacturer's standard wheeled unit designed for transporting and storing volleyball equipment and passing through 36-inch-(910-mm-)wide door openings. Fabricate welded-steel tubing units with heavy-duty casters, including no fewer than two swivel casters. Fabricate wheels from materials that do not damage or mark floors; number of units as required to provide transport and storage for specified equipment.

2.4 SAFETY PADS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Safety Pad Surface-Burning Characteristics: ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- C. Pad Coverings: Provide safety pad fabric covering that is fabricated from puncture- and tear-resistant, PVC-coated polyester or nylon-reinforced PVC fabric, not less than 14-oz./sq. yd (475-g/sq. m) and treated with fungicide for mildew resistance; with surface-burning characteristics indicated, and lined with fire-retardant liner.
- D. Wall Safety Pads: Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with visible surfaces fully covered by seamless fabric covering, free of sag and wrinkles and firmly attached to back of backer board.
 - 1. Backer Board: Not less than 3/8-inch-(9.5-mm-)thick plywood, mat formed, or composite panel.
 - 2. Fire-Resistive Fill: Multiple-impact-resistant foam not less than 2-inch-(50-mm-)thick, fire-resistive neoprene; 6.0-lb/cu. ft. (96-kg/cu. m) density.
 - 3. Size: Each panel section, 24 inches (600 mm) wide by not less than 72 inches (1800 mm) long.
 - 4. Number of Modular Panel Sections: As indicated.
 - 5. Installation Method: Concealed mounting Z-clips.
 - 6. Fabric Covering Color(s): As selected by Architect from manufacturer's full range for two color(s).
 - 7. Graphics: Custom graphics as indicated.
- E. Cut-out Trim: Provide manufacturer's standard flanged cut-out trim kits for fitting pads around switches, receptacles, and other obstructions.
 - 1. Color: Black.

2.5 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for use and finish type indicated.
 - 1. Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - 2. Cast Aluminum: ASTM B 179.
 - 3. Flat Sheet: ASTM B 209 (ASTM B 209M).
- B. Steel: Comply with the following:
 - 1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 2. Steel Tubing: ASTM A 500/A 500M or ASTM A 513, cold formed.
 - 3. Steel Sheet: ASTM A 1011/A 1011M.
- C. Support Cable: 1/4-inch-(6-mm-)diameter, 7x19 galvanized-stranded-steel wire rope with a breaking strength of 7000 lb (3175 kg). Provide fittings complying with wire rope manufacturer's written instructions for size, number, and installation method.

- D. Support Chain and Fittings: For chains used for overhead lifting, provide Grade 80 heat-treated alloy steel chains, complying with ASTM A 391/A 391M, with commercial-quality, hot-dip galvanized steel connectors and hangars.
- E. General-Purpose Chain: For chains not used for overhead lifting, provide carbon steel chain, complying with ASTM A 413/A 413M, Grade 30 proof coil chain or other grade recommended by gymnasium equipment manufacturer. Provide coating type, chain size, number, and installation method complying with manufacturer's written instructions.
- F. Castings and Hangers: Malleable iron, complying with ASTM A 47/A 47M; grade required for structural loading.
- G. Softwood Plywood: DOC PS 1, exterior.
- H. Equipment Wall-Mounted Board: Wood, neutral-color-painted finish, size, and quantity as required to mount gymnasium equipment according to manufacturer's written instructions.
- I. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design.
- J. Grout: Non-shrink, nonmetallic, premixed, factory-packaged, non-staining, noncorrosive, nongaseous grout, complying with ASTM C 1107/C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.
 - 1. Verify critical dimensions.
 - 2. Examine supporting structure, subfloors, and footings below finished floor.
 - 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly where required.
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, are completed.

- C. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.
 - 1. Floor Insert Location: Coordinate location with application of game lines and markers, and core drill floor for inserts after game lines are applied.
 - 2. Floor Insert Elevation: Coordinate installed heights of floor insert with installation and field finishing of finish flooring and floor-plate type.
 - 3. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.
- D. Floor Insert Setting: Position sleeve in oversized, recessed voids in concrete slabs. Clean voids of debris. Fill void around sleeves with grout, mixed and placed to comply with grout manufacturer's written instructions. Protect portion of sleeve above subfloor and footing from splatter. Verify that sleeves are set plumb, aligned, and at correct height and spacing; hold in position during placement and finishing operations until grout is sufficiently cured. Set insert so top surface of completed unit is flush with finished flooring surface.
- E. Wall Safety Pads: Mount with bottom edge at 4 inches (102 mm) above finished floor.
- F. Cut-out Trim: Limit cuts in face of padding from trim unit's corner-to-corner outside dimensions. Install with ends of cuts concealed behind trim flange.
- G. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure built-in and permanently placed gymnasium equipment to structural support and to properly transfer load to in-place construction.
- H. Connections: Connect electric operators to building electrical system.

3.3 ADJUSTING

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.4 CLEANING

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION 116623

SECTION 116653 - GYMNASIUM DIVIDERS

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. Ceiling suspended electric divider curtain

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of gymnasium divider curtain fabric.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium dividers to include in operation and maintenance manuals.

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. Environmental Limitations: Do not install gymnasium dividers until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify size of space, available clearances, obstructions, and position for gymnasium dividers.

1.8 COORDINATION

- A. Coordinate installation of overhead-supported gymnasium dividers and suspension-system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium dividers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of gymnasium dividers.
 - b. Tearing or deterioration of fabric, seams, or other materials beyond normal use.
 - 2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain gymnasium dividers from single source from single manufacturer.

2.2 WALK-DRAW DIVIDER SYSTEMS

- A.
 - 1. Gared Sports Company (www.garedsports.com)
 - 2. Porter Athletics (www.porterathletic.com)Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 3. SJD Sports International (www.sjdsportsinternational.com)
- B. Divider Curtain System: Manually operated, channel track system, and as follows:
 - 1. Top Hem: Double-thickness mesh or solid vinyl for grommets.
 - 2. Outer Edge Hems: Double turned and welded.
 - 3. Bottom Pocket: Double thickness with proof coil chain in pocket.
 - 4. Channel Track: Galvanized steel or formed aluminum.
 - 5. Grommets: Manufacturer's standard material, size, and spacing; for snaps or S-hooks.

2.3 MATERIALS

- A. General-Purpose Chain: For chains not used for overhead lifting, provide carbon steel chain, complying with ASTM A 413/A 413M, Grade 30 proof coil chain or other grade recommended by gymnasium divider manufacturer. Provide coating type, chain size, number, and installation method complying with manufacturer's written instructions.
- B. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal-resistant design.

2.4 DIVIDER CURTAINS

- A. Curtain, Mesh: Woven mesh of polyester yarn coated with vinyl, weighing not less than 9 oz./sq. yd. (305 g/sq. m).
 - 1. Mesh Color: As selected by Architect from full range of industry colors and color densities.

- B. Lower Curtain, Solid: Woven polyester fabric coated with vinyl, 19 oz./sq. yd., 8-foot (2.4-m) height above floor.
 - 1. Fabric Color(s): One color(s), as selected by Architect from full range of industry colors and color densities.
- C. Hems: Folded and electronically welded.
- D. Seams: Electronically welded.
- E. Overall Curtain Height: Floor to ceiling, within installation clearances required.
- F. Bottom of Curtain: Approximately 2 inches (50 mm) above finished floor.
- G. Divider Curtain Flame-Resistance Ratings: Passes NFPA 701, Test 2.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for alignment of mounting substrates, installation tolerances, operational clearances, and other conditions affecting performance of the Work.
 - 1. Verify critical dimensions.
 - 2. Examine supporting structure.
 - 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions.
- B. Unless otherwise indicated, install gymnasium dividers after other finishing operations, including painting, are completed.
- C. Gymnasium Dividers and Components: Install level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.
 - 1. Verify clearances for movable components of gymnasium dividers throughout entire range of operation and for access to operating components.
- D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure gymnasium dividers to structural support and to properly transfer load to in-place construction.

3.3 ADJUSTING

- A. Adjust movable components of gymnasium dividers to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, uneven tension, nonalignment, misplacement,

disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.4 CLEANING

- A. After completing gymnasium divider installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Replace gymnasium divider components and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 116653

SECTION 123216 – MANUFACTURED PLASTIC-LAMINATE-FACED-CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 - Specification sections, apply to work of this section.

1.2 SUMMARY:

- A. Type, size, location and extent of cabinets, casework, and countertops associated manufactured casework.
- B. Installation of sink units mounted in countertops is specified in a Division 15 section. At 34" height casework dim to be measured from sink rim to finish floor. Coordinate top depth as required complying with ADA.
- C. Electrical connections are specified in a Division 26 section.

1.3 WORK INCLUDED:

- A. The extent of manufactured casework systems as shown on drawings, schedules, and specified herein. Where specific materials, finishes, construction details, and hardware are specified herein, the casework contractor shall be held in strict accordance. All items shall be as provided, and publicly cataloged, by one manufacturer to assure physical and dimensional integrity of the system and ready access to additional systems components for a minimum of ten (10) years after completion of this contract. Product from companies not meeting this requirement will not be accepted.
- B. Furnish all items of equipment as listed in the Specifications, Equipment Schedule and/or as shown on the drawings including delivery to the buildings, unpacking, setting in place, leveling, shimming and scribing to walls and floors as required.
- C. Stainless steel sinks and fixtures within plastic laminate tops shall be provided and installed under Division 15. (Opening to be furnished by casework supplier.)

1.4 WORK NOT INCLUDED:

- A. The furnishing, installation and connection of any service lines, drain lines, traps, piping, wire and conduit within the equipment and through, under, or along the backs of working surfaces as required by the specifications and/or as shown on the drawings unless otherwise indicated. Installation of sinks and service fixtures and final connection of all services.
- B. The furnishing, installing and connecting of all vents, revents and special plumbing fixtures or piping to meet local codes, even though not specifically called for in the specifications and/or shown on the drawings.
- C. The furnishing of any framing or reinforcements for walls, floors or ceilings to support any equipment.
- D. The furnishing and installation of specified resilient base finish for all casework. This work is part of a Division 9 Section.

1.5 SYSTEM DESCRIPTION:

- A. All manufactured casework shall be pre-engineered, and cataloged, to rigid modular-matrix sizing allowing for future interchange of components, or entire units. Manufacturers submitting for approval must provide printed catalog information documenting this performance feature; no exceptions will be allowed.

1.6 QUALITY ASSURANCE:

- A. Manufacturer's products shall be publicly catalogued. Manufacturer will show evidence of a minimum of five (5) years experience in providing manufactured casework systems for similar types of projects, produce evidence of financial stability, bonding capacity and adequate facilities and personnel required to perform on this project.
- B. Any manufacturers not listed under Part 2 – Products, paragraph 2.1 Acceptable Manufacturer shall be certified by the Architectural Woodwork Institute (AWI) Quality Certification Program and register this project with AWI/OCP. Work in this section shall comply with the specified grades of work written herein and sections 400 and 1600 of the 7th edition of the Architectural Woodwork Institute Quality Standards. All Casework On This Project Must Display AWI Quality Certification Labels in accordance with AWI/QCP labeling guidelines.
- C. Manufactured casework systems must conform to design, quality of materials, workmanship and function as shown on drawing and specified herein. In the absence of a printed specification, minimum quality standards shall be in accordance with AWI Section 1600B, Sixth Edition, Version 1.1, no exceptions will be permitted; additional requirements shall be as specified herein.
- D. Manufacturer: Provide products certified as meeting or exceeding ANSI-A 161.1-2000 testing standards.
- E. All manufactured casework shall be pre-engineered, and cataloged, to rigid modular sizing allowing for future interchange of components, or entire units. Manufacturers submitting for approval must provide printed catalog information documenting this performance feature.

1.7 SUBMITTALS:

- A. Product Data:
 - 1. In addition to the general conditions as relates to prior approvals, SUBMITTALS of manufacturer's data, installation instructions, and samples are required.
- B. Samples:
 - 1. Submit samples of casework manufacturer's standard decorative laminate colors, patterns, and textures for exposed and semi-exposed materials for architect's selection. Samples of other materials or hardware shall be made available if requested.
 - 2. Architect may request representative full-size samples for evaluation prior to approval. Samples may be impounded by architect/owner until completion of project to ensure compliance with specifications.

C. Production Drawings:

1. Submit production drawings for casework systems and countertops showing layout, elevations, ends, cross-sections, face modular values, service run spaces and location of services.
2. Include layout of units with relation to surrounding walls, doors, windows, and other building components.
3. Coordinate production drawings with other work involved.

1.8 PRODUCT HANDLING:

- A. Deliver laminate clad casework and countertops only after wet operations in building are completed. Schedule with General Contractor.
- B. Store completed laminate clad casework and countertops in a ventilated place, protected from the weather, with relative humidity range of 20% to 50%.
- C. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with a protective covering.

1.9 JOB CONDITIONS:

- A. Humidity and Temperature Controls:
 1. Advise contractor of requirements for maintaining heating, cooling, and ventilation in installation areas as required to reach relative humidity necessary to maintain optimum moisture content.

1.10 WARRANTY:

- A. Manufactured products carry a five (5) year Guaranty to the original Owner against defective material and workmanship from the date of substantial completion. This is a warranty of replacement and repair for defects in material and/or workmanship without charge.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Manufacturer and Product Type: Subject to compliance with requirements, provide products of one of the following:
 1. Construction features to be in accordance with TMI catalogued FIXED, FLEXIBLE & MODULAR casework that are fully modular and dimensionally integrated to allow owner interchange of doors, drawers and interior components. TMI Systems Design Corporation, 50 South Third Avenue West, Dickenson, North Dakota, 58601, www.tmisystems.com/products/reference/index.asp
 2. LSI
 3. Stevens Industries, Inc.
 4. Reynolds & Doyle, Inc.

2.2 DEFINITIONS AND MATERIALS:

Listed are definitions and materials commonly used in defining decorative laminate clad casework. Refer to FABRICATION section for those items selected for use on this project.

A. Definitions: Identification of casework parts by surface visibility.

1. Open Interiors: Any open storage unit without solid door or drawer fronts and units with full glass doors.
2. Closed Interiors: Any closed storage unit behind solid door or drawer fronts, glass insert doors, sliding solid doors, and/or acrylic doors.
3. Exposed Ends: Any storage unit exterior side surface that is visible after installation.
4. Other Exposed Surfaces: Faces of doors and drawers when closed, tops of cabinets less than 72" above finished floor.
5. Semi-Exposed Surfaces: Interior surfaces which are visible, bottoms of wall cabinets and tops of cabinets 72" or more above finished floor.
6. Concealed Surfaces: Any surface not normally visible after installation.

B. Core Materials:

1. Particleboard: Medium density 45-50 pound western particleboard of fir or pine meeting or exceeding ANSI A 208.1-1993, M-3 requirements. Thicknesses used are 1/4", 1/2", 3/4", and 1".
2. Hardboard: Prefinished hardboard in 1/4" thickness meeting or exceeding commercial standards CS-251.

C. Decorative Laminates/Veneer Where Applicable:

1. High pressure decorative laminate GP28 (.028), NEMA Test LD3 - 1991.
2. High pressure decorative laminate GP50 (.050), NEMA Test LD-3 - 1991.
3. High pressure decorative laminate PF42 (.042), NEMA Test LD-3 - 1991.
4. High Pressure cabinet liner CL20 (.020), NEMA Test LD-3 - 1991.
5. Thermally-fused melamine laminate tested to meet NEMA Test LD-3 - 1991.
6. High pressure backer BK20 (.020).

D. Laminate Color Selection:

1. Basic cabinet body color:
 - a. To include surfaces of all components, including drawer boxes, to be covered with melamine laminate as a minimum requirement; drawer boxes not matching basic color will be rejected.
 - b. Thermally-fused melamine laminate shall be available in manufacturer's standard dove grey, frosty white, or light beige color.
2. Colors for other cabinet surfaces, grade GP28, shall be selected from the current year Wilson Art series. A maximum of one (1) color to be selected per unit face and five (5) colors per project. Minimum of 120 color selections available.
3. Colors for countertop grades, GP50 and PF42, shall be selected from the current year Wilson Art standard solid and pattern offering. A maximum of five (5) colors per project.

E. Edging Materials / Colors:

1. 1mm PVC banding, machine applied with waterproof hot melt adhesive.
2. 3mm PVC banding, machine applied with waterproof hot melt adhesive with external edges and outside corners of door and drawer fronts, and countertops, machine profiled to 1/8" radius for safety.
3. PVC banding shall be available in three (3) colors: dove grey, frosty white, or light beige to match basic cabinet body color selected, or in seven (7) contrasting solid colors: slate grey, black, dawn, wild rose, clear teal, holly berry, and larkspur.
4. Barbed T-edging or laminate self edge on cabinet components will not be acceptable.
5. Glass insert doors in built-in casework shall be glazed with 1/8" D.S.A. glass. In relocatable casework shall be glazed with clear 1/4" thick sheet acrylic, stipple finish.
6. Sliding glass doors shall be clear 1/4" thick sheet acrylic, stipple finish, mounted in aluminum track.
7. Provide extruded rigid PVC of design to hold and trim glass inserts in framed doors. Available in dove grey, frosty white or light beige to match basic cabinet body, or in contrasting slate grey or black color.

2.3 SPECIALTY ITEMS:

A. Metal Parts:

1. Countertop support brackets, under counter support frames, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and epoxy powder painted in dove grey, frosty white or light beige to match basic cabinet body color, or in a contrasting slate grey or black color.

2.4 CABINET HARDWARE:

A. Hinges:

1. Shall be five knuckle, 2-3/4", overlay type, hospital tip, .095" thick steel. Hinges shall have a minimum of eight (8) edge and leaf fastenings. Doors 48 inches and over in height shall have three (3) hinges per door. Available in epoxy finish, color to be dove grey, frosty white or light beige to match basic cabinet body color, or in contrasting black, sienna brown or brushed chrome. Provide magnetic door catch with minimum ten (10) pound pull, attached with screws and slotted for adjustment.

B. Door and Drawer Front Pulls:

1. Owner to select one of the following:
 - a. Epoxy powder coated metal wire, 96mm spacing on screws. Pull design shall comply with American Disability Act (ADA).
 - b. Rectangular semi-recessed, injection molded ABS plastic, glue and screw-fastened.
2. Available in dove grey, frosty white or light beige to match basic cabinet body color or in contrasting black or sienna brown.

C. Drawer Slides:

1. Shall be Blum style No. BS230M with epoxy finish. Slides will have a 100-pound load rating at full extension a built-in, positive stop both directions, with self-closing feature. Slides shall have a lifetime warranty as offered by the slide manufacturer.
2. File drawer slides shall be Blum BS430E full extension. Slides shall have a lifetime warranty as offered by the slide manufacturer.
3. Knee space and pencil drawers shall be equipped with Blum No. 320 for under counter or support frame mounting.

D. Adjustable Shelf Supports:

1. Shall be injection-molded polycarbonate, clear color to blend with selected interior finish, friction fit into cabinet end panels and vertical dividers, readily adjustable on 32mm (approximately 1-1/4") centers. Each shelf support shall have two (2) integral support pins, 5mm diameter, to interface pre-drilled holes, and to prevent accidental rotation of support. The supports shall be automatically adaptable to 3/4" or 1" thick shelving and shall provide non-tip feature for shelving. Supports are designed to readily permit field fixing of shelf if desired. Structural load testing shall show loading to 1,500 pounds (375 pounds per support) without failure.

E. Locks:

1. For doors and drawers as shown on drawings shall be National Lock #M4-7054C, removable core, disc tumbler, cam style lock with strike. Each lock shall be furnished with two (2) keys. Locks for sliding 3/4" doors shall be a disc type plunger lock, sliding door type with strike. Locks for sliding glass/acrylic doors shall be a ratchet type sliding showcase lock.
2. Chain bolts shall be 3" long, shall have a 18" pull and an angle strike to secure inactive door on cabinets over 72" in height. Elbow catches shall be used on inactive doors up to and including 72" in height.

F. Sliding Door Track:

1. For both glass and wood sliding doors shall be anodized aluminum double channel.

G. Pendaflex File Suspension Rails:

1. All file drawers shall include a pair of 14 gauge steel pendaflex file suspension rails, epoxy coated in dove grey, frosty white or light beige to match basic cabinet color. File followers, or other split bottom hardware, shall not be acceptable.

H. Under counter Support Frame:

1. Welded steel countertop support frames shall be provided at all knee spaces where indicated on drawings. Frames shall be available in 3" increments to clear span 24" to 60" width. Frames shall readily accept pencil and knee space drawers, and shall be designed to interface under counter support brackets. Available in dove grey, frosty white or light beige to match basic cabinet body color or in contrasting slate grey or black color.

I. Coat Rods:

1. 1 inch diameter, 14-gauge chrome plated steel installed in captive mounting hardware.

2.5 FABRICATION:

A. Fabricate casework to dimensions, profiles, and details shown.

B. Cabinet Body Construction:

1. Tops and bottoms shall be joined to cabinet ends and internal cabinet components such as fixed horizontals, rails and verticals shall be joined using 10mm diameter industrial grade hardwood dowels, laterally fluted with chamfered ends, securely glued and clamped under pressure during assembly to secure joints and cabinet squareness. Use minimum of six (6) dowels at each joint for 24" deep cabinets and minimum of four (4) dowels at each joint for 12" deep cabinets.
2. Unless specifically indicated, core shall be 3/4" thick particleboard. Edging and surface finishes as indicated herein.
3. Unit backs on fixed cabinetry shall be 1/4" thick prefinished hardboard and on relocatable cabinetry, backs shall be 3/4" thick particleboard structurally doweled into cabinet end and top panels, color matched to cabinet interior. Exposed backs on fixed or movable cabinets to be 3/4" thick particleboard, color matched to cabinet interior, exterior surface GP-28 laminate as selected.
4. All fixed under counter and tall units shall have an integral base created by extending end panels to floor and factory applied blocking between sides. Provide 96mm (nominal 4") high toe base unless otherwise indicated on the drawings.
5. All under counter units except sink base units, shall be provided with full sub-top. Sink base units shall be provided with open top, front welded steel/epoxy painted sink rail full width at top front edge concealed behind face rail/doors, split back removable access panels and bottom panel to have CL-20 high pressure cabinet liner both faces, color to match interior color. No exceptions will be permitted.
6. All end panels and vertical dividers, except sink base units, shall be prepared to receive adjustable shelf hardware at 32mm (approximately 1-1/4") centers. Door hinges, drawer slides and pullout shelves shall mount on line boring to maintain vertical alignment of components and provide for future relocation of doors, drawers, shelves and/or pull-out shelves.
7. All exposed and semi exposed edges of basic cabinet components shall be factory edged with PVC banding, machine applied with waterproof hot melt adhesive.
 - a. Edging shall be 1mm PVC, available in dove grey, frosty white or light beige to match basic cabinet body color.
8. Adjustable shelf core shall be 3/4" thick particleboard up to 30" wide, 1" thick particleboard over 30" wide.
 - a. Front edge shall have factory-applied 1mm PVC, color to match shelf color.
9. Interior Finish, Units with Open Interiors:

- a. Sides, top, bottom, horizontal and vertical members and adjustable shelving faced with melamine laminate with matching prefinished back. Available in dove grey, frosty white or light beige color

10. Interior Finish, Units with Closed Interiors:

- a. Sides, top, bottom, horizontal and vertical members and adjustable shelving faced with melamine laminate with matching prefinished back. Available in dove grey, frosty white or light beige color.

11. Exposed Ends:

- a. Shall be faced with high-pressure decorative laminate GP-28 (.028) color from casework manufacturer's full range offering of at least 120 colors.

12. Wall Unit Bottom:

- a. Shall be faced with melamine laminate in dove grey, frosty white or light beige to match basic cabinet body color.

13. Wall and Tall Unit Tops:

- a. The top edge of all wall and tall unit end panels shall be factory edged with 1mm PVC to match basic cabinet body color; raw edges at top of wall and tall end panels will not be permitted.
- b. Top surface will be laminated with melamine in dove grey, frosty white or light beige to match basic cabinet body color.

14. Balanced construction of all laminated panels is mandatory. Unfinished core stock, even on concealed surfaces, will not be permitted. No exceptions.

C. Drawers:

- 1. Sides, back and sub front shall be particleboard, 1/2" thick, laminated with melamine in dove grey, frosty white or light beige to match basic cabinet body color. The back and sub front are doweled and glued into the sides. Dowels shall be fluted, with chamfered ends and a minimum diameter of 8mm. Top edge is banded with 1mm PVC edging in a matching color.
- 2. Drawer bottom shall be particleboard, 1/2" thick, laminated with melamine in dove grey, frosty white or light beige to match basic cabinet body color, screwed directly to the bottom edges of the drawer box. Drawer bottom less than 1/2" thick will not be permitted.
- 3. Paper storage drawers are constructed similar except retaining hood shall be included at the rear of each drawer.
- 4. Painted finishes on drawer sides and/or bottom will not be permitted.

D. Door/Drawer Fronts:

- 1. Core for all doors and applied drawer fronts shall be 3/4" thick particleboard. All edges shall be finished as indicated herein.
- 2. Double doors shall be used on all cabinets in excess of 24" wide.
- 3. Exterior faces shall be laminated with high pressure decorative laminate GP-28, color as selected, high pressure cabinet liner CL20 in dove grey, frosty white or light beige to match basic cabinet body color on inside surface.
- 4. All edges shall be finished with 3mm PVC available in dove grey, frosty white or light beige to match basic cabinet body color or in contrasting black, sienna

brown, dawn, wild rose, clear teal, holly berry or larkspur colors. External edges and outside corners shall be machine profiled to 1/8" radius.

2.6 DECORATIVE LAMINATE COUNTERTOPS:

- A. All nominal 1" thick laminate clad countertops shown on drawings shall be constructed with 3/4" particleboard core laminated top face with GP50 1/8" high-pressure decorative laminate, with BK20 backer underside. Provide tight joint fasteners where needed. All exposed edges, including edges of backsplash where used, shall have 3mm PVC banding, machine applied with waterproof hot melt adhesive. Exposed edges and corners shall be machine profiled to 1/8" radius for safety. Edging shall be available in dove grey, frosty white or light beige to match basic cabinet body color or in contrasting black, slate grey, dawn, wild rose, clear teal, holly berry, or larkspur colors.

- 1. Sinks Stainless Steel – Refer to Plumbing Division 22 Specification.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. The installer must examine the job site and the conditions under which the work under this section is to be performed, and notify the contractor in writing of unsatisfactory conditions. Do not proceed with work under this section until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 PREPARATION:

- A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.

3.3 INSTALLATION:

Filler Panels:

- A. Install casework with factory-trained supervision authorized by manufacturer. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit. Provide filler strips, scribe strips and mouldings as indicated or required, and in finish to match cabinet face.
- B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- C. Attach countertops securely to base units which have been installed level. Spline and glue joints in countertops; provide concealed mechanical clamping of joint. Provide cutouts for fixtures and appliances as indicated; drill pilot holes at corners before making cutouts. Smooth cut edges and coat with waterproof coating or adhesive.

The shimming of countertops to achieve a level installation where base cabinets have not been installed level is not acceptable.

3.4 CLEANING AND PROTECTION:

- A. Repair or remove and replace defective work as directed upon completion of installation.

- B. Clean plastic surfaces, repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged parts or units.
- C. Advise contractor of procedures and precautions for protection of casework and tops from damage by other trades until acceptance of the work by the Owner. If required cover completed work with 4-mil polyethylene protective enclosure, applied in a manner to allow easy removal without damaging cabinets. Remove cover immediately before time of final acceptance.

END OF SECTION 123216

SECTION 126600 - TELESCOPING STANDS

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-attached telescoping stands.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design telescoping stands, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Telescoping stands shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ICC 300.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for telescoping stands.
- B. Shop Drawings: For telescoping stands in both stacked and extended positions. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied finishes.
- D. Delegated-Design Submittal: For telescoping stands indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by a Kentucky licensed professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Welding certificates.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For telescoping stands to include in operation and maintenance manuals.

1. Precautions for cleaning materials and methods that could be detrimental to telescoping stand finishes and performance.
2. Methods for maintaining upholstery fabric.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," and AWS D1.3, "Structural Welding Code - Sheet Steel."
- 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. Standard: Provide telescoping stands to comply with ICC 300.
- E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- F. Preinstallation Conference: Conduct conference at Project site.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings and construction contiguous with telescoping stands by field measurements before fabrication. Verify locations of walls, columns, and other construction that will interface with operating telescoping stands.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wood:
 1. Lumber: Kiln dried, surfaced four sides; southern pine complying with SPIB's "Standard Grading Rules for Southern Pine Lumber" for C&Btr Finish (C and better) grade-of-finish requirements.
 2. Plywood: APA-grade trademarked, DOC PS 1.
- B. Steel:
 1. Structural-Steel Shapes, Plates, and Bars: ASTM A 36/A 36M.
 2. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.
 3. Uncoated Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold-rolled commercial steel), or ASTM A 1011/A 1011M, Designation CS (hot-rolled commercial steel).
 4. Tubing: ASTM A 500, cold formed; ASTM A 501, hot formed; or ASTM A 513, mechanical.
- C. Extruded Aluminum: ASTM B 221 (ASTM B 221M), alloy as standard for manufacturer.

- D. Polyethylene Plastic: High-density polyethylene; molded, color-pigmented, textured, impact-resistant, structural formulation.

2.2 TELESCOPING STANDS

- A. General: Operable systems of multiple-tiered seating on interconnected folding platforms that close, without being dismantled, into a nested stack for storing. Stand units permit opening and closing of adjacent rows, allow individual and collective rows to be locked open for use, and close with vertical faces of upper skirts on the same vertical plane.
- B. Wall-Attached Telescoping Stands.: Forward-folding system, in which the bleachers open in the forward direction by initially moving the front row away from the stack to the fully extended position, and the rear of bleacher understructure is permanently attached to wall construction.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Hussey (MAXAM Telescopic Seating) or comparable product by one of the following:
 - a. Hussey Seating Company.
 - b. Interkal LLC.
 - c. Irwin Telescopic Seating Company; Irwin Seating Company.
 - d. <Insert manufacturer's name>
 - 2. Row Spacing: 24-inch row spacing.
 - 3. Row Rise: Lower Floor to be Custom Height to permit aisle use for egress from Mezzanine. Upper floor seating to have 11 ½" rise on seats.
 - 4. Elevated Front Row: In height indicated on Drawings.
 - 5. Operation: Automatic, friction-type, integral power unit.
 - a. Limit Switches: Automatically stop integral power system when telescoping stands reach fully opened or closed positions.
 - b. Motion Monitor: Flashing light with self-contained warning horn, rated at 85 dB at 10 feet (3 m), mounted under telescoping seating for audio and visual warning during integral power operation.
 - c. Transformer: As required to coordinate current characteristics of motor and control station with building electrical system.
 - d. Remote Control: Portable pendant control system.

2.3 COMPONENTS

- A. Benches: Seats and skirts.
 - 1. Material: Molded polyethylene plastic with contour surfaces.
 - a. Color: As selected by Architect from manufacturer's standard.
 - 2. Bench Height: Not less than 16 inches (406 mm) or more than 18 inches (457 mm).
 - 3. Bench Depth: 12 inches (305 mm).
- B. Wheelchair-Accessible Seating: Locate seating cutouts to provide wheelchair-accessible seating at locations indicated on Drawings.
 - 1. Equip tiers adjacent to wheelchair-accessible seating with front rails as required by referenced safety standard.

2. Equip cutouts with full-width front closure panels that match decking construction and finish and that extend from underside of tiers adjacent to cutouts to 1-1/2 inches (38 mm) from finished floor.
- C. Deck: Plywood, 3/4 inch (19 mm) thick.
1. Finish: Polyethylene textured overlay bonded to substrate with exterior glue.
 - a. Color: As selected by Architect from manufacturer's standard colors.
- D. Risers: Steel sheet with manufacturer's standard, rust-inhibiting coating or hot-dip galvanized finish.
- E. Safety Rails: Structural steel, finished with manufacturer's standard powder coat system.
1. Self-storing mid-aisle handrails located at centerline of each vertical aisle with seating on both sides.
 2. End rails (guards) that are telescoping and self-storing.
 3. Removable rails around accessible seating cutouts and truncations.
 4. Color: Black.
- F. Understructure: Structural steel.
1. Finish: Manufacturer's standard rust-inhibiting finish.
 2. Color: Manufacturer's standard.
- G. Support Column Wheels: Nonmarring, soft, rubber-face wheel assembly under each support column.
1. Include wheels of size, number, and design required to support stands and operate smoothly without damaging the flooring surface, but no fewer than four per column or less than 3-1/2 inches (89 mm) in diameter and 1 inch (25.4 mm) wide.
- H. Fasteners: Vibration proof, in manufacturer's standard size and material.
- 2.4 ACCESSORIES
- A. Steps:
1. Slip-resistant, abrasive tread nosings at vertical aisles.
 2. Intermediate aisle steps, fully enclosed, at each vertical aisle.
 3. Transitional top step, fully enclosed, at each vertical aisle where last row of telescoping stands is adjacent to a cross aisle.
- B. Closure Panels and Void Fillers:
1. Aisle closures at foot level that produce flush vertical face at aisles when system is stored.
 2. End panels covering exposed ends of stands in the stored position.
 3. Panels at cutouts and truncations for accessible seating.
 4. Rear fillers including supports for closing openings between top row and rear wall of adjoining construction.
- C. Signage:

1. Row letters at each row end.
2. Seat numbers at 18 inches (457 mm) o.c. on benches.
3. Accessibility signs at each accessible space and accessible aisle seat.

2.5 FABRICATION

- A. Fabricate understructure from structural-steel members in size, spacing, and form required to support design loads specified in referenced safety standard.
- B. Weld understructure to comply with applicable AWS standards.
- C. Round corners and edges of components and exposed fasteners to reduce snagging and pinching hazards.
- D. Form exposed sheet metal with flat, flush surfaces, level and true in line, and without cracking and grain separation.
- E. Seating Supports: Fabricate supports to withstand, without damage to components, the forces imposed by use of stands without failure or other conditions that might impair the usefulness of seating units.
 1. Cantilever bench seat supports to produce toe space uninterrupted by vertical bracing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where telescoping stands are to be installed, 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 INSTALLATION

- A. Install telescoping stands to comply with referenced safety standard and manufacturer's written instructions.

3.3 ADJUSTING AND CLEANING

- A. On completion of installation, lubricate, test, and adjust each telescoping stand unit so that it operates according to manufacturer's written operating instructions.
- B. Clean installed telescoping stands on exposed and semiexposed surfaces. Touch up shop-applied finishes or replace components as required to restore damaged or soiled areas.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain telescoping stands.

END OF SECTION 126600

SECTION 310000 - EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. A report of geotechnical services was completed and prepared for the site of this Work and is included in the specifications.

1.2 SUMMARY

- A. Section Includes:
- B. This Section includes all work; labor, machinery, disposal and replacement of unsuitable soil, removal of rock and any materials encountered to plan bottom depth/ subgrade for all earthwork related items. These items shall include, but are not limited to, earthwork procedures for drives, parking lots, pavements, building foundations, footings, caissons, building slabs, utility trenches, etc.
- C. All excavation, fill work shall be considered as unclassified with regard to type and condition with costs reflecting all expenses necessary to achieve plan bottom depth/ subgrade and all grading effort as shown on the drawings. Plan bottom depth is defined as the lowest elevation of excavation required to construct work shown on drawings and outlined in specifications. This includes bottom of excavation for foundations, utilities, roads, parking, sidewalks, required unsuitable soils undercutting and/or rock removal as indicated or noted on drawings or geotechnical report.
- D. No change in the contract price will be considered for any materials encountered and/or required to be removed or replaced to achieve plan bottom depth/ subgrade the earthwork requirements.
- E. The following is a list of the items, which are included as a part of this work:
 - 1. Preparing subgrades for slabs-on-grade, walks, pavements, turf, grasses and planting.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Drainage course for concrete slabs-on-grade.
 - 4. Subbase course for concrete walks and pavements.
 - 5. Subbase course and base course for asphalt paving.
 - 6. Subsurface drainage backfill for walls and trenches.
 - 7. Excavating and backfilling trenches for utilities and pits for buried utility structures.
- F. **Sanitary Sewer Lagoon Soils Note:** Soils used for lagoon liner material shall be classified as Group IV soils as defined in 902 KAR 10:085. These soils are clayey texture soils and contain forty (40) percent or more clay-sized particles and include sandy clay, silty clay and clay. **No soil meeting this requirement was found on site during geological drilling/testing**

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices for earth moving specified in Division 1 Section "Unit Prices."
- B. Quantity allowances for earth moving are included in Division 1 Section "Allowances."
- C. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.
 - 1. 24 inches (600 mm) outside of concrete forms other than at footings.
 - 2. 12 inches (300 mm) outside of concrete forms at footings.
 - 3. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
 - 4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - 5. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
 - 6. 6 inches (150 mm) beneath pipe in trenches, and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices changes in the Work.
 - 2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating equipment

equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp (103-kW) flywheel power with bucket-curling force of not less than 28,700 lbf (128 kN) and stick-crowd force of not less than 18,400 lbf (82 kN) with extra-long reach boom; measured according to SAE J-1179.
 2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp (172-kW) flywheel power and developing a minimum of 47,992-lbf (213.3-kN) breakout force with a general-purpose bare bucket; measured according to SAE J-732.
- I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. (0.57 cu. m) or more in volume that exceed a standard penetration resistance of [100 blows/2 inches (97 blows/50 mm)] when tested by a geotechnical testing agency, according to ASTM D 1586.
- J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- K. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, structures, drainage fill, drainage course, or topsoil materials.
- M. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- N. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones 1 inch (25 mm) or larger in any dimension, and other extraneous materials harmful to plant growth.
- 1.
 2. Topsoil Source: Reuse surface soil stockpiled on the site and /or amend existing surface soil to produce topsoil as defined above with minimum 4 percent organic matter. Supplement with imported topsoil when quantities are insufficient to achieve the grading effort as shown on the drawings. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
- O. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- 1.5 SUBMITTALS
- 1.
- B. Samples for Verification: For the following products, in sizes indicated below:
1. Geotextile: 12 by 12 inches (300 by 300 mm).
 2. Warning Tape: 12 inches (300 mm) long; of each color.
- C. Qualification Data: For qualified testing agency.

- D. Material Test Reports: For each on-site and] borrow soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D 2487.
 - 3. Laboratory compaction curve according to ASTM D 698 or ASTM D 1557 as required by Geotechnical Report.
 - 4. All reports are to be signed by a Professional Engineer with licences to practice in the state of this project
- E. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- B. Preexcavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
- C. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction. Prepared aggregate subbase shall comply with the Kentucky Transportation Cabinet (KTC) standard specifications, latest edition and with the local governing regulations, if more stringent than herein specified.

1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Utility Locator Service: Notify "Call 811 Before You Dig" for area where Project is located before beginning earth moving operations.
- D. Do not commence earth-moving operations until temporary erosion- and sedimentation-control measures, specified in Division 2 Section 02010 " Erosion and Sediment Control " and shown on Erosion Sediment Contrail Plan are in place.
- E. Do not commence earth-moving operations until plant-protection measures specified in Division 2 Section "Tree Protection and Trimming" are in place.
- F. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1.

2. Notify Architect not less than two days in advance of proposed utility interruptions.
 3. Do not proceed with utility interruptions without Architect's written permission.
 4. Contact utility-locator service for area where Project is located before excavating.
 5. Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.
 6. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to the utility owner's satisfaction at no cost to the Owner.
- G. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- H. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
 2. Parking vehicles or equipment.
 3. Foot traffic.
 4. Erection of sheds or structures.
 5. Impoundment of water.
 6. Excavation or other is digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- I. Do not direct vehicle or equipment exhaust towards protection zones.
- J. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487 or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
1. CL and CH with a dry density above 100, a Liquid Limit less than 50 and a Plastic Index under 30 will also be considered satisfactory
 2. CL and CH may be used as recommended by Geotechnical Investigation and report.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction or as noted in the Geotechnical report..
 2. CL and CH with a dry density below 100, a Liquid Limit greater than 50 and a Plastic Index greater than 30 will be considered for use only by recommendation by the Geotechnical Engineer. Additional requirements for use of these types of soil may be required
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.
- I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.
- J. Sand: ASTM C 33; fine aggregate.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: Class 2; AASHTO M 288.
 - 2. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
 - 3. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
 - 4. Tear Strength: 56 lbf (250 N); ASTM D 4533.
 - 5. Puncture Strength: 56 lbf (250 N); ASTM D 4833.
 - 6. Apparent Opening Size: No. 40 (0.425-mm) sieve, maximum; ASTM D 4751.
 - 7. Permittivity: 50 gpm per sqft per, minimum; ASTM D 4491.
 - 8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: Class 2; AASHTO M 288.
 - 2. Grab Tensile Strength: 247 lbf (1100 N); ASTM D 4632.
 - 3. Sewn Seam Strength: 222 lbf (990 N); ASTM D 4632.
 - 4. Tear Strength: 90 lbf (400 N); ASTM D 4533.
 - 5. Puncture Strength: 90 lbf (400 N); ASTM D 4833.
 - 6. Apparent Opening Size: No. 30 (0.6-mm) sieve, maximum; ASTM D 4751.
 - 7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
 - 8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

- A. Controlled Low-Strength Material: Self-compacting, flowable concrete material produced from the following:
 - 1. Portland Cement: ASTM C 150, Type I.
 - 2. Fly Ash: ASTM C 618, Class C or F.
 - 3. Normal-Weight Aggregate: ASTM C 33, 3/8-inch (10-mm)] nominal maximum aggregate size.
 - 4. Foaming Agent: ASTM C 869.
 - 5. Water: ASTM C 94/C 94M.
 - 6. Air-Entraining Admixture: ASTM C 260.
- B. Produce low-density, controlled low-strength material with the following physical properties:
 - 1. As-Cast Unit Weight: 30 to 36 lb/cu. ft. (480 to 576 kg/cu. m)) at point of placement, when tested according to ASTM C 138/C 138M.
 - 2. Compressive Strength: 80 psi (550 kPa) 10 psi (965 kPa), when tested according to ASTM C 495.

2.4 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

- D. Protect subgrades and foundation soils from freezing temperatures and frost. Provide protective insulating materials as necessary.
- E. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES (BLASTING IS NOT ALLOWED ON THIS PROJECT)

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 - 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches (600 mm) outside of concrete forms other than at footings.
 - b. 12 inches (300 mm) outside of concrete forms at footings.
 - c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
 - f. 6 inches (150 mm) beneath pipe in trenches, and the greater of [24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Pile Foundations: Stop excavations 6 to 12 inches (150 to 300 mm) above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.

3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.
 - B. Excavations at Edges of Tree- and Plant-Protection Zones:
 1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 2. Cut and protect roots according to requirements in Division 2 Section "Tree Protection and Trimming."
- 3.6 EXCAVATION FOR WALKS AND PAVEMENTS
- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.
- 3.7 EXCAVATION FOR UTILITY TRENCHES
- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
 - B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.
 1. Clearance: 12 inches (300 mm) each side of pipe or conduit
 - C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
 3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
 4. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
 - D. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
 1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
 - E. Trenches in Tree- and Plant-Protection Zones:
 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3. Cut and protect roots according to requirements in Division 2 Section "Tree Protection and Trimming."

3.8 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 25 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
 3. Do not proof roll wet or saturated subgrades.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.
 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for Record Documents.
 3. Testing and inspecting underground utilities.
 4. Removing concrete formwork.
 5. Removing trash and debris.
 6. Removing temporary shoring and bracing, and sheeting.

7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section "Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase course. Concrete is specified in Division 3 Section "Cast-in-Place Concrete."

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Place and compact initial backfill of subbase material free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

G. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches (300 mm) over the pipe or conduit.

H. Coordinate backfilling with utilities testing.

I. Place and compact final backfill of satisfactory soil to final subgrade elevation.

J. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

K. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Refer to Shot-Rock and Clay Fill Recommendations in Geotechnical Investigation

C. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.

2. Under walks and pavements, use satisfactory soil material.

3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.
- 6.

D. Place soil fill on subgrades free of mud, frost, snow, or ice.

E.

3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698 and following recommendations of the Geotechnical Report.
 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 98 percent. The moisture content shall be maintained between minus 3, plus 1 percent of the optimal moisture
 2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 95 percent. The moisture content shall be maintained between minus 3, plus 1 percent of the optimal moisture
 3. Under turf or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85 percent.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm).
 2. Walks: Plus or minus 1 inch (25 mm).

3. Pavements: Plus or minus 1/2 inch (13 mm).

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.17 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Division 2 Section "Subdrainage."

B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch (150-mm) course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches (300 mm) of filter material, placed in compacted layers 6 inches (150 mm) thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).

1. Compact each filter material layer to 95 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches (300 mm) of final subgrade, in compacted layers 6 inches (150 mm) thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.

2. Place and compact impervious fill over drainage backfill in 6-inch- (150-mm-) thick compacted layers to final subgrade.

3.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Install separation fabric on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

B. Under pavements and walks, place subbase course on separation fabric according to fabric manufacturer's written instructions and where indicated on the drawings..

C. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

D. On prepared subgrade, place subbase course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

2. Place base course material over subbase course under hot-mix asphalt pavement.

3. Shape subbase course to required crown elevations and cross-slope grades.

4. Place subbase course 6 inches (150 mm) or less in compacted thickness in a single layer.

5. Place subbase course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.

6. Compact subbase 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 1557.

E. Pavement Shoulders: Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials

and compact simultaneously with each subbase layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.19 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Under slabs-on-grade, install drainage fabric on prepared subgrade according to manufacturer's written instructions where indicated on the drawings, overlapping sides and ends. Place drainage course on drainage fabric and as follows
- B. Place drainage course on subgrades free of mud, frost, snow, or ice.
- C. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 - 1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 - 2. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.
 - 3. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
 - 4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 98 percent of maximum dry unit weight according to ASTM D 698.

3.20 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 - 2. Determine that fill material and maximum lift thickness comply with requirements.
 - 3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.
 - 4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of controlled fill.
 - 5. Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly.
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design-bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet (30 m) or less of wall length, but no fewer than two tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) or less of trench length, but no fewer than two tests.
 4. All column footings interior and along exterior wall shall be individually tested for acceptance for bearing capacity using the dynamic cone penetration.
 4. 5. The foundation wall footings shall be tested using the dynamic cone penetration test at an interval of not less than 30'.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.21 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Contractor shall remove all stone and filter fabric placed for construction access and scarify all sub-grades to a depth of 4" prior to placement of topsoil. Contractor shall place a minimum of 8" of topsoil on all areas outside of the buildings that are not paved or constructed with other improvements. Topsoil shall be free of stones and amended as necessary to meet definitions of topsoil prior to placement on site

END OF SECTION 310000

SECTION 311000 - SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 015713 - Temporary Erosion and Sediment Control.
- D. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.
- E. Section 312200 - Grading: Topsoil removal.
- F. Section 312200 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.
- G. Section 312323 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.
- H. Section 312323 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.
- I. Section 329300 - Plants: Relocation of existing trees, shrubs, and other plants.
- J. Section 329300 - Plants: Pruning of existing trees to remain.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fill Material: As specified in Section 312200 - Grading

PART 3 EXECUTION

3.01 SITE CLEARING

- A. Comply with other requirements specified in Section 017000.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

- A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure,

SITE CLEARING

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paving, playing fields, lawns, and planting beds.

- B. Do not begin clearing until vegetation to be relocated has been removed.
- C. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
 - 1. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
 - 2. Around other vegetation to remain within vegetation removal limits.
- D. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
 - 1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
 - 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 - 3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 - 4. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
 - 5. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.
- E. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.
- F. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.
- G. Existing Trees shall be protected. The following table shall be used to assess damages if trees are removed without written permission.
- H. Cross sectional areas of trees and their base value based on \$48 per square inch.

1.		Cross Section	Base Value
2.	Diameter	Square Inches	\$48/Sq. In.
3.	6	28.3	\$1,358
4.	12	113.1	\$5,429
5.	24	452.4	\$21,715
6.	26	530.9	\$25,483
7.	28	615.8	\$29,558
8.	30	706.9	\$33,931
9.	32	804.3	\$38,606
10.	34	907.9	\$43,579
11.	36	1017.9	\$48,859
12.	38	1134.1	\$54,437
13.	40	1256.6	\$60,336
14.	48	1809	\$86,832

3.04 DEBRIS

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 312319 - DEWATERING (DURING CONSTRUCTION)

PART 1 -GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the design and installation of a temporary de-watering system until completion of construction to remove surface and subsurface waters from structure or utility trench excavations and pavement and sidewalk excavations as required.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 2 Section 310001: Earthwork
- C. The Site Sub-Contractor shall be responsible for providing dewatering as associated with sitework and as required for the progress of the work.
- D. The Sub-Contractor installing work in trenches shall be responsible for providing dewatering as associated with utility work in trenches as required for the progress of the work.
- E. The Earthwork contractor shall be responsible for providing dewatering as associated with earthwork in pavement and sidewalk excavations as required for the progress of the work, unless indicated otherwise. If the contractor allows soils to become saturated and therefore deemed unsuitable by the on site testing agent, any required remediation shall be the responsibility of the contractor, including any undercut/over-excavation required to achieve suitable bearing conditions. This shall be at no additional cost to the Owner.
- F. The Concrete foundation sub-contractor shall be responsible to provide dewatering as associated with footing excavations as required for the progress of the work.

1.3 SUBMITTALS

- A. General: Submit to the Owner's Representative for review, the proposed methods of construction, including de-watering, excavation, bedding, filling, compaction and back filling for the various portions of the Work. The Owner's Representative's review shall be for method only. The Contractor shall remain responsible for the adequacy and safety of the methods.
- B. Submittals shall include the following:
 - 1. Design notes and drawings.
 - 2. Descriptive literature of the temporary de-watering system.
 - 3. Layout of all piping involved.

- C. Binders: All submittal data shall be bound in three-ring binders and all sections shall be tabbed and properly indexed.

1.4 QUALITY ASSURANCE

- A. Standards: The de-watering of any utility structure, utility trench or any other excavation and the disposal of water during construction shall be in accordance with all local and state government rules, regulations, and applicable permit conditions.

1.5 CRITERIA

- A. The de-watering system shall be developed to the point that it is capable of de-watering the site surrounding all structures, pavement areas, utility structures, or utility trenches as shown on the Drawings. Each system shall be capable of de-watering and maintaining ground water levels to a minimum depth of 2 feet below the respective excavation.

1.6 PERMITS

- A. General: Each Subcontractor shall be responsible for the preparation of, submission of, costs for, and any additional requirements necessary to obtain all permits required for de-watering.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Equipment: The equipment specified herein shall be standard de-watering equipment of proven ability as designed, manufactured, and installed by firms having experience in the design and production of such equipment. The equipment furnished shall be designed, constructed and installed in accordance with standard industry practices and methods.

PART 3 -EXECUTION

3.1 INSTALLATION

- A. De-watering: The sub-contractors shall install a temporary de-watering systems for the removal of surface and subsurface water encountered during construction of the proposed structures, pavements or excavation of utility trenches.

3.2 PUMPING AND DRAINAGE

- A. Maintenance: The sub-contractors shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering the proposed excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed sub-grade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. If the contractor allows soils to become saturated and therefore deemed unsuitable by the on site testing agent, any required remediation shall be the responsibility of the contractor, including any undercut/over-excavation required to achieve suitable bearing conditions. This shall be at no additional cost to the Owner.

- B. Bearing: De-watering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the sub-grade soils at the proposed bottom of the excavation and to preserve the integrity of adjacent structures. At a minimum, the water level shall be two feet below the trench or excavation bottom. Well or pump installations shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.
- C. Rim Ditches: Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.
- D. Flotation: the sub-contractors shall prevent Flotation, by maintaining a positive and continuous operation of the de-watering system. The Contractor shall be fully responsible and liable for all damages, which may result from failure of this system.
- E. Fuel Spills: The sub-contractors shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.

3.3 PROTECTION AND SITE CLEAN-UP

- A. Immediately upon completion of the de-watering operations, the sub-contractor shall remove all of his equipment, materials, and supplies from the site of the work, remove all surplus material and debris, fill in all holes or excavations, and grade the site to elevations of the surface levels which existed before work started.

END OF SECTION 312319

SECTION 313116 TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Chemical soil treatment.

1.02 PRICE AND PAYMENT PROCEDURES

- A. See Section 012200 - Unit Prices, for additional unit price requirements.

1.03 REFERENCE STANDARDS

- A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; United States Code; 1947 (Revised 2001).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
- C. Test Reports: Indicate regulatory agency approval reports when required.
- D. Manufacturer's Certificate: Certify that toxicants meet or exceed specified requirements.
- E. Certificate of compliance from authority having jurisdiction indicating approval of toxicants.
- F. Record moisture content of soil before application.
- G. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing this type of work and:
 - 1. Having minimum of 2 years documented experience.
 - 2. Approved by manufacturer of treatment materials.
 - 3. Licensed in Lexington, Kentucky.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year installer's warranty against damage to building caused by termites.
 - 1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Manufacturers:
 - 1. Bayer Environmental Science Corp: www.nobugs.com.
 - 2. FMC Professional Solutions: www.fmcprosolutions.com.
 - 3. Syngenta Professional Products: www.syngentaprofessionalproducts.com.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Toxicant Chemical: EPA approved; synthetically color dyed to permit visual identification of treated soil.
- C. Diluent: Recommended by toxicant manufacturer.

2.02 MIXES

- A. Mix toxicant to manufacturer's instructions.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- B. Verify final grading is complete.

3.02 APPLICATION

- A. Comply with requirements of U.S. EPA and applicable state and local codes.
- B. Spray apply toxicant in accordance with manufacturer's instructions.
- C. Apply toxicant at following locations:
 - 1. Under Slabs-on-Grade.
 - 2. In Crawl Spaces.
 - 3. At Both Sides of Foundation Surface.
 - 4. Soil Within 10 feet of Building Perimeter For a Depth of 1 feet.
- D. Under slabs, apply toxicant immediately prior to installation of vapor barrier.
- E. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.
- F. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
- G. Re-treat disturbed treated soil with same toxicant as original treatment.
- H. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 PROTECTION

- A. Do not permit soil grading over treated work.

END OF SECTION

SECTION 321123 - AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aggregate base course.
- B. Paving aggregates.

1.02 RELATED REQUIREMENTS

- A. Section 330513 - Manholes and Structures: Manholes including frames.
- B. Section 321216 - Asphalt Paving: Binder and finish asphalt courses.
- C. Section 321313 - Concrete Paving: Finish concrete surface course.

1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 012200 - Unit Prices, for general requirements applicable to unit prices for earthwork.
- B. Coarse Aggregate: By the cubic yard. Includes supplying aggregate material, stockpiling, scarifying substrate surface, placing, and compacting.
- C. Fine Aggregate: By the cubic yard. Includes supplying aggregate material, stockpiling, scarifying substrate surface, placing where required, and compacting.

1.04 REFERENCE STANDARDS

- A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; American Association of State Highway and Transportation Officials; 1965 (2004).
- B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2001 (2004).
- C. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.
- D. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2007.

- E. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
- F. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2007.
- G. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- H. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2006.
- I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
- J. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.
- K. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2005.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Materials Sources: Submit name of imported materials source.
- C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Coarse Aggregate: Coarse aggregate, conforming to State of Kentucky Highway Department standard.
- B. Fine Aggregate: Sand; conforming to State of Kentucky Highway Department standard.
- C. Geotextile Fabric: Non-biodegradable, woven.

2.02 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.
- B. Where aggregate materials are specified using ASTM D 2487 classification, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the work are as indicated.

AGGREGATE BASE COURSES

PAYNEVILLE ELEMENTARY SCHOOL RENOVATION AND ADDITION
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- B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

- A. Place aggregate in maximum 4 inch layers and roller compact to specified density.
- B. Level and contour surfaces to elevations and gradients indicated.
- C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch.
- C. Variation From Design Elevation: Within 1/2 inch.

3.05 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556.
- C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor").
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade.

3.06 CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Kentucky Transportation Cabinet (KYTC) Standard Specifications for Road and Bridge Construction, latest edition, and Supplemental Specifications to the Standard Specifications.

1.2 SUMMARY

- A. Section Includes:
 - 1. Asphalt surface treatments.
 - 2. Cold milling of existing asphalt pavement.
 - 3. Hot-mix asphalt patching.
 - 4. Hot-mix asphalt paving.
 - 5. Hot-mix asphalt overlay.

1.3 DEFINITION

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
 - 1. Job-Mix Designs: For each job mix proposed for the Work.
- B. Qualification Data: For qualified manufacturer and Installer.
- C. Material Test Reports: For each paving material.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by KYTC.
- B. Installer Qualifications: Must have Certificate of Eligibility from the Kentucky Transportation Cabinet
- C. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

- D. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the Standard Specifications of the Kentucky Transportation Cabinet for asphalt paving work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- E. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
 - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - b. Review condition of subgrade and preparatory work.
 - c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
 - d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 - 1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
 - 2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
 - 3. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
 - 4. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, complying with KYTC Standard Specifications Section 805.
- C. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel or combinations thereof, complying with KYTC Standard Specifications Section 804.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 10 percent by weight of the total aggregate mass.
- D. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.

- E. Recycled (Reclaimed) Asphalt Pavement (RAP): Milled or removed asphalt pavement may be utilized in accordance with KYTC Standard Specifications Section 409.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO MP 1a, PG 64-22. The Contractor may utilize PG 58-28 when asphalt mixture contains more than 15% RAP.
- B. Prime Coat: ASTM D 2027, medium-curing cutback asphalt, MC-30 or MC-70.
- C. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- D. Water: Potable.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- B. Sand: AASHTO M 29, Grade Nos. 2 or 3.
- C. Paving Geotextile: AASHTO M 288, nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes meeting requirements of the Kentucky Transportation Cabinet (KYTC) or Asphalt Institute (AI) MS-2 and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Base Course: KYTC mixture designation Class 1 Base or a Marshall mixture from AI MS-2. There shall be no restrictions on polish resistant aggregates (utilize KYTC Type "D" aggregates). Recycled Asphalt Pavement may be utilized in accordance with KYTC Standard Specifications Section 409.
 - 3. Surface Course: KYTC mixture designation Class 1 Surface or a Marshall mixture from AI MS-2. The mixture gradation may pass through the restricted zone and there shall be no restriction on polish resistant aggregates (utilize KYTC Type "D" aggregates). Recycled Asphalt Pavement (RAP) may be utilized in accordance with KYTC Standard Specifications Section 409.
- B. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes designed according to procedures established by the Kentucky Transportation Cabinet (KYTC) or Asphalt Institute (AI) MS-2 and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Provide mixes complying with composition, grading, and tolerance requirements in ASTM D 3515 for the following nominal, maximum aggregate sizes:

- a. Base Course: Mixture with a nominal maximum aggregate size of .75 inch (19 mm) with a minimum voids in the mineral aggregate (VMA) of 12 percent.
- b. Surface Course: Mixture with a nominal maximum aggregate size of 0.38 inch (9.5 mm) with a minimum VMA of 14 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
 - 2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
 - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.
- D. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.2 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
 - 1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m). Comply with provisions in KYTC Standard Specifications Section 406.
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.3 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
 - 1. Mill to a depth of 2 inches (50 mm).
 - 2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
 - 3. Control rate of milling to prevent tearing of existing asphalt course.
 - 4. Repair or replace curbs, driveway aprons, manholes, and other construction damaged during cold milling.
 - 5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
 - 6. Patch surface depressions deeper than 1 inch (25 mm) after milling, before wearing course is laid.
 - 7. Handle milled asphalt material according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."
 - 8. Keep milled pavement surface free of loose material and dust.
 - 9. Do not allow milled materials to accumulate on-site.

3.4 PATCHING

- A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
 - 1. Undersealing: Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseal pieces firmly.
 - 2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.
- E. Placing Patch Material: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.5 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.
 - 1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of [1/4 inch (6 mm)].
 - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
 - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
 - 3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.6 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted. Comply with applicable provisions of KYTC Standard Specifications Section 403 for delivery, placement, spreading and the compaction of the mixture.
 - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 - 2. Place hot-mix asphalt surface course in single lift.
 - 3. Spread mix at minimum temperature of 250 deg F (121 deg C).
 - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.
 - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
 - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
 - 3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).

4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.8 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
 1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 1. Base Course: Plus or minus 1/2 inch (13 mm).
 2. Surface Course: Plus 1/4 inch (6 mm), no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch (6 mm).
2. Surface Course: 1/8 inch (3 mm).
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

C. Design for a minimum fall of 1% to facilitate drainage (2% recommended).

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.
 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- E. Replace and compact hot-mix asphalt where core tests were taken.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.11 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION 321216

SECTION 321313 - CEMENT CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. KYDOH Specification Division 500 "PCC Pavement and Non-Structural Concrete Construction"

1.2 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
 - 1. Service Areas.
 - 2. Curbs and gutters.
 - 3. Walkways.
 - 4. Concrete Stairs and ramps.
- B. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.
 - 2. Division 2 Section "Pavement Joint Sealants" for joint sealants within concrete pavement and at isolation joints of concrete pavement with adjacent construction.
 - 3. Division 3 Section "Cast-in-Place Concrete" for general building applications of concrete.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Samples: 12"x12" sample panel to show exposed aggregate finish.
- D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
- E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Admixtures.
 - 4. Curing compounds.
 - 5. Applied finish materials.
 - 6. Bonding agent or adhesive.

7. Joint fillers.

F. Preinstallation conference and minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

E. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.

G. Mockups: Cast mockups of full-size sections of concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Engineer.

2. Notify Engineer seven days in advance of dates and times when mockups will be constructed.

3. Obtain Engineer's approval of mockups before starting construction.

4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.

5. Demolish and remove approved mockups from the site when directed by Engineer.

6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1. Before submitting design mixes, review concrete pavement mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with concrete pavement to attend, including the following:

a. Contractor's superintendent.

b. Independent testing agency responsible for concrete design mixes.

d. Concrete subcontractor.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves of a radius 100 feet (30.5 m) or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
- C. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- D. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars; assembled with clips.
- E. Plain Steel Wire: ASTM A 82, as drawn.
- F. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.
- G. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- H. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- I. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

- A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
- B. Portland Cement: ASTM C 150, Type I or II.

1. Fly Ash: ASTM C 618, Class F or C.
 2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- C. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:
1. Class: 4S.
 2. Class: 4M.
 3. Class: 1N.
 4. Maximum Aggregate Size: 1 inch (25 mm) nominal.
 5. Exposed aggregate: Gravel washed natural mineral aggregate, .5 inch minimum and 1 inch maximum size, natural reds and browns color range from a single source. Provide samples for color selection and approval by Owner.
 5. Do not use fine or coarse aggregates containing substances that cause spalling.
- I. Water: ASTM C 94.
- 2.4 ADMIXTURES
- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- 2.5 FIBER REINFORCEMENT (Not Applicable)
- 2.6 CURING MATERIALS – ALL PRODUCTS SHALL BE FROM NEW SEALED CONTAINERS. CONTRACTOR SHALL NOTIFY ARCHITECT AFTER 28 DAY CURING PERIOD TO ARRANGE A PREINSTALLATION MEETING AND INSPECTION OF WALK FOR ACCEPTANCE PRIOR TO APPLICATION OF SILANE.
- A. Absorptive Cover: Non Staining Burlene 10 oz. burlap combined with the moisture-retention and reflective features of 4 mil white opaque poly, extruded into burlap or equal (install and use per manufacturer's recommendations)
- B. Moisture-Retaining Cover: Non Staining Burlene 10 oz. burlap combined with the moisture-retention and reflective features of 4 mil white opaque poly, extruded into burlap or equal (install and use per manufacturer's recommendations)
- C. Water: Potable. BE CERTAIN NO WATER IS IN LINES FOR PUMPS OR SPRAYERS PRIOR TO APPLICATION OF SILANE.
- D. Evaporation Retarder: Waterborne, NON-film/membrane forming, manufactured for application to fresh concrete.
- E. Clear Non Residual Waterborne Curing Compound: Discoloration or mottling of concrete is not acceptable and will require removal and replacement of concrete at contractor's expense. Contractor shall utilize non-film, non-membrane forming cure that is compatible with the penetrating silane sealer used on this project. Acceptable products are listed in this specification.
- F. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

- I. Products: Follow all manufacturer's installation guidelines and recommendations for pre and post preparation and clean up. Subject to compliance with requirements, provide one of the following:
 1. Evaporation Retarder:
 - a. L&M E-Con
 2. Clear Resin Non-Residual Non-Membrane-Forming Curing Compound:
 - a. L&M Cure (Cure R or Cure RZ are not acceptable)
 - b. Sonneborn – Sonosil
 - c. Chem-Rex Mastertop CST – (Jack Schwein-513-289-4867 cell)
 3. Silane Water Repellant Penetrating Sealer:

No rain 24 hours before and 48 hours after application– contractor shall schedule accordingly. Apply 28 days after placement. Follow all manufacturer's installation guidelines and recommendations – apply at rate of 150SF / gallon unless otherwise indicated

 - a. EVONIK Protectosil CHEM-TRETE BSM 40 VOC - (Jack Schwein-513-289-4867 cell)
 - b. BASF Hydrozo Clear 40 VOC
 - c. Prosoco SL100

2.7 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.
- C. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
- D. Pavement-Marking Paint: Alkyd-resin type; ready mixed; complying with FS TT-P-115, Type I, or AASHTO M 248, Type N.
 1. Color: Blue for handicapped requirements, yellow for fire lanes, white elsewhere.
- E. Wheel Stops: Precast, air-entrained concrete; 2500-psi (17.2-MPa) minimum compressive strength; approximately 6 inches (150 mm) high, 9 inches (225 mm) wide, and 84 inches (2130 mm) long. Provide chamfered corners and drainage slots on underside, and provide holes for dowel-anchoring to substrate.
 1. Dowels: Galvanized steel, diameter of 3/4 inch (19 mm), minimum length 10 inches (254 mm).

2.8 CONCRETE MIXES

- A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.

1. Do not use Owner's field quality-control testing agency as the independent testing agency.
- C. Proportion mixes to provide concrete with the following properties:
 1. Compressive Strength (28 Days): 4500 psi.
 2. Slump Limit: 3 to 4 inches.
- D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.
- G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:
 1. Air Content: 6.0 percent for 1-inch (25-mm) maximum aggregate.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
- B. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.
 1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- C. Project-Site Mixing: Comply with requirements and measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixers of 1 cu. yd. (0.76 cu. m) or smaller capacity, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixers of capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap to adjacent mats.

3.4 JOINTS

- A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
 - 1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 - 2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 - 3. Provide tie bars at sides of pavement strips where indicated.
 - 4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of 50 feet (15.25 m), unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler less than 1/2 inch (12 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
 - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - a. Radius: 1/4 inch (6 mm).
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
- F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
 1. Radius: 1/4 inch (6 mm).

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery, at Project site, or during placement.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms.

Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

- H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer, or use bonding agent if approved by Engineer.
- I. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.
- J. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
- K. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
 - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- L. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- M. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- N. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

- A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
 - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
 - 3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

3.7 SPECIAL FINISHES

- A. Exposed Aggregate (submit samples for color approval by Owner)
 - 1. Decorative aggregate shall be integral to concrete mix, not seeded on top of concrete.
 - 2. Wash concrete surfaces to which surface retarder has been applied with clean water and scrub with stiff bristle brush exposing decorative aggregate to match sample panel.
 - 3. Provide penetrating silane sealer per manufacturers recommendations and specifications.

3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing. Film or membrane forming retarders are not acceptable.
- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.

- c. Absorptive non-staining cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with non-staining moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus 3/8 inch (9 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unlevelled straightedge not to exceed 1/4 inch (6 mm).
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer.
- B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).
 1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- C. Testing Services: Testing shall be performed according to the following requirements:

1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
 2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
 3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
 5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
 6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m). One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
 7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 8. When total quantity of a given class of concrete is less than 50 cu. yd. (38 cu. m), Engineer may waive compressive-strength testing if adequate evidence of satisfactory strength is provided.
 9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
 10. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).
- D. Test results shall be reported in writing to Engineer, Owner, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as the sole basis for approval or rejection.
- F. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
- 3.13 REPAIRS AND PROTECTION
- A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

- B. Drill test cores where directed by Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.
- E. Do not use salt as de-icing or snow removal agent during first year after installation. Only use sand or other non-damaging de-icing agent as approved by Owner during the first year of use.

END OF SECTION 321313

SECTION 321373– CONCRETE PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. KYDOH Specification Section 807.04 “Joint Fillers”

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Expansion and contraction joints within portland cement concrete pavement.
 - 2. Joints between portland cement concrete and asphalt pavement.
 - 3. Joints between portland cement concrete and building structure.

1.3 SUBMITTALS

None required

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
 - 2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F (4.4 deg C).
 - 3. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than that allowed by joint sealant manufacturer for application indicated.

- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

- A. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.
- B. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
- C. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.
- D. Available Products: Subject to compliance with requirements, cold-applied joint sealants that may be incorporated into the Work include, but are not limited to, the following:
- E. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Type NS Silicone Sealant for Concrete:
 - a. Roadsaver Silicone-SL; Crafcro Inc.
 - b. 888; Dow Corning.
 - 2. Type SL Silicone Sealant for Concrete and Asphalt:
 - a. 890-SL; Dow Corning.
 - 3. Multicomponent Low-Modulus Sealant for Concrete and Asphalt:
 - a. SOF-SEAL; W.R. Meadows, Inc.

2.3 HOT-APPLIED JOINT SEALANTS

- A. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3406.
- B. Sealant for Concrete and Asphalt: Single-component formulation complying with ASTM D 3405.
- C. Available Products: Subject to compliance with requirements, hot-applied joint sealants that may be incorporated into the Work include, but are not limited to, the following:
- D. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Elastomeric Sealant for Concrete:
 - a. Superseal 444/777; Crafcro, Inc.

- b. POLY-JET 3406; W.R. Meadows, Inc.

2. Sealant for Concrete and Asphalt:

- a. ROADSAVER 221; Crafcro Inc.
- b. Product #9005; Koch Materials Company.
- c. Product #9030; Koch Materials Company.
- d. SEALTIGHT HI-SPEC; W.R. Meadows, Inc.

2.4 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rod for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depths, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.
- D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

2.5 PRIMERS

- A. Primers: Product recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint- sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's written installation instructions applicable to products and applications indicated, unless more stringent requirements apply.

- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of backer materials.
 - 2. Do not stretch, twist, puncture, or tear backer materials.
 - 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealants from surfaces adjacent to joint.
 - 2. Use tooling agents that are approved in writing by joint sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint sealant manufacturer's written instructions, unless otherwise indicated.
- G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 321373

SECTION 321713 – CONCRETE WHEEL STOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Precast concrete parking bumpers and anchorage.

1.02 PRICE AND PAYMENT PROCEDURES

- A. See Section 012200 - Unit Prices, for additional unit price requirements.

1.03 REFERENCE STANDARDS

- A. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2007.
- B. ASTM C 33 - Standard Specification for Concrete Aggregates; 2007.
- C. ASTM C 150 - Standard Specification for Portland Cement; 2007.
- D. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2006.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide unit configuration, dimensions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Parking Bumpers: Precast concrete, conforming to the following:
 - 1. Profile: Manufacturer's standard.
 - 2. Cement: ASTM C 150, Portland Type I - Normal; white color.
 - 3. Concrete Materials: ASTM C 33 aggregate, water, and sand.
 - 4. Reinforcing Steel: ASTM A 615/A 615M, deformed steel bars; unfinished finish, strength and size commensurate with precast unit design.
 - 5. Air Entrainment Admixture: ASTM C 260.
 - 6. Concrete Mix: Minimum 5000 psi, 28 day strength, air entrained to 5 to 7 percent.
 - 7. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.
 - 8. Embed reinforcing steel, and drill or sleeve for two dowels.
 - 9. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
 - 10. Minor patching in plant is acceptable, providing appearance of units is not impaired.
- B. Dowels: Cut reinforcing steel, 1/2 inch diameter, 18 inch long, pointed tip.
- C. Adhesive: Epoxy type.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install units without damage to shape or finish. Replace or repair damaged units.
- B. Install units in alignment with adjacent work.
- C. Fasten units in place with 2 dowels per unit.

END OF SECTION

SECTION 321723 - PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Parking lot markings, including parking bays, crosswalks, arrows, handicapped symbols, and curb markings.
- B. Roadway lane markings and crosswalk markings.
- C. "No Parking" curb painting.
- D. Thermoplastic shall be used at intersection markings (Stop Bars, Crosswalks, Turn Arrows, Bike Lane Markings, etc) and as specified in the Contract Documents.

1.02 RELATED REQUIREMENTS

- A. Section 321216 - Asphalt Paving.
- B. Section 321313 - Concrete Paving.

1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 012100 - Allowances, for cash allowances affecting this section.

1.04 REFERENCE STANDARDS

- A. FS TT-B-1325 - Beads (Glass Spheres); Retro-Reflective; Rev. D, 2007.
- B. FS TT-P-1952 - Paint, Traffic Black, and Airfield Marking, Waterborne; Rev. E, 2007.
- C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.
- D. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; <http://mutcd.fhwa.dot.gov>; current edition.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Certificates: Submit for each batch of paint and glass beads stating compliance with specified requirements.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Paint: 2 containers, 1 gallon size, of each type and color.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.
- B. Deliver glass beads in containers suitable for handling and strong enough to prevent loss during shipment accompanied by batch certificate.
- C. Store products in manufacturer's unopened packaging until ready for installation.
- D. Store and dispose of solvent-based materials, and materials used with solvent-based materials,

in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Line and Zone Marking Paint: MPI No. 97 Latex Traffic Marking Paint; color(s) as indicated.
 - 1. Roadway Markings: As required by authorities having jurisdiction.
 - 2. Parking Lots: White.
 - 3. Handicapped Symbols: Blue.
- B. Line and Zone Marking Paint: Refer to Section 099000.
- C. Paint For Obliterating Existing Markings: FS TT-P-1952; black for bituminous pavements, gray for portland cement pavements.
- D. Reflective Glass Beads: FS TT-B-1325, Type I (low index of refraction), Gradation A (coarse, drop-on); with silicone or other suitable waterproofing coating to ensure free flow.
- E. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.
- F. Dual Zone usage mark per plans.
- G. School Athletic / Band markings per plans or per owner's direction.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Clean surfaces thoroughly prior to installation.
 - 1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
- D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.
- E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

- F. Temporary Pavement Markings: When required or directed by Architect, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.
 - 1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
 - 2. At Contractor's option, temporary marking tape may be used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner.

3.03 INSTALLATION

- A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.
- B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.
- C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.
- D. Comply with FHWA MUTCD manual (<http://mutcd.fhwa.dot.gov>) for details not shown.
- E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.
- F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends.
 - 1. Apply paint in two coats for permanent applications. Apply one coat only for temporary striping applications.
 - 2. Wet Film Thickness: 0.015 inch, minimum.
 - 3. Length Tolerance: Plus or minus 3 inches.
 - 4. Width Tolerance: Plus or minus 1/8 inch.
- G. Roadway Traffic Lanes: Use suitable mobile mechanical equipment that provides constant agitation of paint and travels at controlled speeds.
 - 1. Conduct operations in such a manner that necessary traffic can move without hindrance.
 - 2. Place warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic.
 - 3. If paint does not dry within expected time, discontinue paint operations until cause of slow drying is determined and corrected.
 - 4. Skip Markings: Synchronize one or more paint "guns" to automatically begin and cut off paint flow; make length of intervals as indicated.
 - 5. Use hand application by pneumatic spray for application of paint in areas where a mobile paint applicator cannot be used.
 - 6. Distribute glass beads uniformly on the paint lines within ten seconds without any waste, applied at rate of 6 pounds per gallon of paint; if the marking equipment does not have a glass bead dispenser, use a separate piece of equipment adjusted and synchronized with the paint applicator; remove and replace markings having faulty distribution of beads.
- H. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
 - 1. Mark the International Handicapped Symbol at indicated parking spaces.
 - 2. Hand application by pneumatic spray is acceptable.
- I. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

3.04 DRYING, PROTECTION, AND REPLACEMENT

- A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.
- B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.
- C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.
- D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.
- E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.
- F. Replace removed markings at no additional cost to Owner.

END OF SECTION

SECTION 323113 - CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Galvanized steel chain-link fabric.
 - 2. Zn-5-Al-MM alloy-coated, steel chain-link fabric.
 - 3. PVC-coated, steel chain-link fabric.
 - 4. Galvanized steel framework.
 - 5. Polymer-coated steel framework.
- B. Related Sections include the following:
 - 1. "Earthwork" for filling and for grading work.

1.3 DEFINITIONS

- A. CLFMI: Chain Link Fence Manufacturers Institute.
- B. Zn-5-Al-MM Alloy: Zinc-5 percent aluminum-mischmetal alloy.

1.4 SUBMITTALS

- A. Product Data: Material descriptions, construction details, dimensions of individual components and profiles, and finishes for the following:
 - 1. Fence and gate posts, rails, and fittings.
 - 2. Chain-link fabric, reinforcements, and attachments.
 - 3. Gates and hardware.
- B. Shop Drawings: Show locations of fence, each gate, posts, rails, and tension wires and details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, elevations, sections, gate swing and other required installation and operational clearances, and details of post anchorage and attachment and bracing.
- C. Samples for Initial Selection: Manufacturer's color charts or 6-inch (150-mm) lengths of actual units showing the full range of colors available for components with factory-applied color finishes.

- D. Product Certificates: Signed by manufacturers of chain-link fences and gates certifying that products furnished comply with requirements.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Field Test Reports: Indicate and interpret test results for compliance of chain-link fence and gate grounding and bonding with performance requirements.
- G. Maintenance Data: For the following to include in maintenance manuals specified in Division 1:
 - 1. Polymer finishes.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.
- C. Source Limitations for Chain-Link Fences and Gates: Obtain each color, grade, finish, type, and variety of component for chain-link fences and gates from one source with resources to provide chain-link fences and gates of consistent quality in appearance and physical properties.

1.6 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- B. Field Measurements: Verify layout information for chain-link fences, poles and netting and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include
1. Master Halco
 2. Ameristar
 3. Sportsfield Specialties

2.2 CHAIN-LINK FENCE FABRIC

- A. Steel Chain-Link Fence Fabric: Height indicated on Drawings. Provide fabric fabricated in one-piece widths for fencing in height of 12 feet (3.6 m) and less. Comply with CLFMI's "Product Manual" and with requirements indicated below:
1. Mesh and Wire Size: 2" mesh, (9 ga core, 6 ga finish) PVC-coated wire unless indicated otherwise on Drawings (use 1-3/4" mesh, 9 ga core, 6 ga finish for tennis court fencing).
 2. Zinc-Coated Fabric: ASTM A 392, with zinc coating applied to steel wire before weaving according to ASTM A 817, Type II, zinc coated (galvanized) with the following minimum coating weight:
 - a. Class 1: Not less than 1.2 oz./sq. ft. (366 g/sq. m) of uncoated wire surface.
 3. Zn-5-Al-MM Alloy-Coated Fabric: ASTM F 1345, with metallic coating Type III, Zn-5-Al-MM alloy coated, applied to steel wire according to ASTM A 817 with the following minimum coating weight:
 - a. Class 1: Not less than 0.60 oz./sq. ft. (183 g/sq. m) of uncoated wire surface.
 4. PVC-Coated Fabric: ASTM F 668, Class [1] over metallic-coated steel wire.
 - a. Metallic Coating: Zinc, Zn-5-Al-MM alloy.
 - b. Color: Black complying with ASTM F 934.
 5. Coat selvage ends of fabric that is metallic coated during the weaving process with manufacturer's standard clear protective coating.
- B. Selvage: Knuckled at both selvages.

2.3 INDUSTRIAL FENCE FRAMING

- A. Round Steel Pipe: Standard weight, Schedule 40, galvanized steel pipe complying with ASTM F 1083. Comply with ASTM F 1043, Material Design Group IA, external and internal coating Type A, consisting of not less than 1.8-oz./sq. ft. (0.55-kg/sq. m) zinc; and the following strength and stiffness requirements:

Line, End, Corner, and Pull Posts and Top Rail: Per requirements for Light Industrial Fence.

- o Gate Posts shall be: 4" diameter SS40 for 10' tall fence, 3" diameter SS40 for 8' tall fence and 2-1/2" diameter SS40 for 5' tall fence. Use 4" diameter SS40 for 8' tall double swing gates.
- o Corner posts shall be 4" diameter SS40 for 10' tall fence and 3" diameter SS40 for 5' and 8' tall fence
- o Line Posts shall be 3" diameter SS40 for 10' tall fence, 2-1/2" diameter for 5' and 8' tall fence (8' max. spacing)
- o All gate Framing shall be 2" diameter SS40
- o All horizontal rails shall be 1-5/8" diameter SS40 (top rails shall be SS20)

- B. Round Steel Pipe: Cold-formed, electric-resistance-welded steel pipe. Comply with ASTM F 1043, Material Design Group IC, with minimum yield strength of 50,000 psi (344 MPa); and the following external and internal coatings and strength and stiffness requirements:
1. Coatings: Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film.
 2. Coatings: External, Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film. Internal, Type D, consisting of 81 percent, not less than 0.3-mil- (0.0076-mm-) thick, zinc pigmented coating.
 3. Coatings: Type C, Zn-5-Al-MM alloy, consisting of not less than 1.8-oz./sq. ft. (0.55-kg/sq. m) coating.
 4. Coatings: PVC black or galvanized as indicated on drawings.
- C. Post Brace Rails: Match top rail for coating and strength and stiffness requirements. Provide brace rail with truss rod assembly for each gate, end, and pull post. Provide two brace rails extending in opposing directions, each with truss rod assembly, for each corner post and for pull posts. Provide rail ends and clamps for attaching rails to posts.
- D. Top Rails: Fabricate top rail from lengths 21 feet (6.4 m) or longer, with swaged-end or fabricated for expansion-type coupling, forming a continuous rail along top of chain-link fabric.
- E. Intermediate Rails: Match top rail for coating and strength and stiffness requirements.
- F. Bottom Rails: Match top rail for coating and strength and stiffness requirements.
- G. Extended Members: Extend posts above top of chain-link fabric as indicated on Drawings or as required to attach assemblies.

2.4 TENSION WIRE

- A. General: Provide horizontal tension wire at the following locations:
1. As indicated on Drawings.
- B. Metallic-Coated Steel Wire: 0.177-inch- (4.5-mm-) diameter, marcelled tension wire complying with ASTM A 824 and the following:
1. Coating: Type I, aluminum coated (aluminized).
 2. Coating: Type II, zinc coated (galvanized) by the hot-dip process, with the following minimum coating weight:
 - a. Matching chain-link fabric coating weight.
 3. Coating: Type III, Zn-5-Al-MM alloy with the following minimum coating weight:
 - a. Matching chain-link fabric coating weight.

2.5 INDUSTRIAL SWING GATES

- A. General: Comply with ASTM F 900 for the following swing-gate types:
1. Single gate.
 2. Double gate.

- B. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1083 and ASTM F 1043 for materials and protective coatings.
- C. Metal Pipe and Tubing: Aluminum. Comply with ASTM B 429 and ASTM F 1043 for materials and protective coatings.
- D. Frames and Bracing: Fabricate members from round tubing with outside dimension and weight according to ASTM F 900 for the following gate fabric height:
 - 1. Gate Fabric Height: 6 feet (1.83 m) or less.
 - 2. Gate Fabric Height: More than 6 feet (1.83 m).
- E. Frame Corner Construction: As follows:
 - 1. Welded.
 - 2. Assembled with corner fittings [and 5/16-inch- (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider].
 - 3. Welded or assembled with corner fittings [and 5/16-inch- (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider].
- F. Gate Posts: Fabricate members from round aluminum pipe with outside dimension and weight according to ASTM F 900 for the following gate fabric heights and leaf widths:
 - 1. Gate Fabric Height by Leaf Width: 6 feet (1.83 m) or less by 4 feet (1.22 m) or less.
 - 2. Gate Fabric Height by Leaf Width: 6 feet (1.83 m) or less by over 4 feet (1.22 m) but not over 10 feet (3.05 m).
 - 3. Gate Fabric Height by Leaf Width: 6 feet (1.83 m) or less by over 10 feet (3.05 m) but not over 18 feet (5.49 m).
 - 4. Gate Fabric Height by Leaf Width: Over 6 feet (1.83 m) by 6 feet (1.83 m) or less.
 - 5. Gate Fabric Height by Leaf Width: Over 6 feet (1.83 m) by over 6 feet (1.83 m) but not over 12 feet (3.66 m).
- G. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame as indicated on Drawings or as required to attach assemblies.
- H. Hardware: Latches permitting operation from both sides of gate, hinges, center gate stops and, for each gate leaf more than 5 feet (1.5 m) wide, keepers. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

2.6 FITTINGS

- A. General: Provide fittings for a complete fence installation, including special fittings for corners. Comply with ASTM F 626.
- B. Post and Line Caps: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron. Provide weathertight closure cap for each post. Prime and paint to match fence fabric.
 - 1. Provide line post caps with loop to receive tension wire or top rail.
- C. Rail and Brace Ends: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron. Provide rail ends or other means for attaching rails securely to each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Hot-dip galvanized pressed steel or round steel tubing. Not less than 6 inches (153 mm) long.
 2. Rail Clamps: Hot-dip galvanized pressed steel. Provide line and corner boulevard clamps for connecting intermediate and/or bottom rails in the fence line to line posts.
- E. Tension and Brace Bands: Hot-dip galvanized pressed steel.

2.7 CAST-IN-PLACE CONCRETE

- A. General: Comply with ACI 301 for cast-in-place concrete.
- B. Materials: Portland cement complying with ASTM C 150, aggregates complying with ASTM C 33, and potable water Measure, batch, and mix Project-site-mixed concrete according to ASTM C 94.
1. Concrete Mixes: Normal-weight concrete air entrained with not less than 3000-psi (20.7-MPa) compressive strength (28 days), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum size aggregate.
- C. Materials: Dry-packaged concrete mix complying with ASTM C 387 for normal-weight concrete mixed with potable water according to manufacturer's written instructions.

2.8 GROUT AND ANCHORING CEMENT

- A. Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

2.9 POLYMER FINISHES

- A. Supplemental Color Coating: In addition to specified metallic coatings for steel, provide fence components with polymer coating.
- B. Metallic-Coated Steel Tension Wire: PVC-coated wire complying with ASTM F 1664, Class 2b.
- C. Metallic-Coated Steel Framing: Comply with ASTM F 1043 for polymer coating applied to exterior surfaces and, except for tubular shapes, to exposed interior surfaces.
1. Polymer Coating: Not less than 10-mil- (0.254-mm-) thick PVC or 3-mil- (0.076-mm-) thick polyester finish.
- D. Fittings, Post and Line Caps, Rail and Brace Ends, Top Rail Sleeves, Tension and Brace Bands, Tension Bars, Truss Rod Assemblies, Tie Wires, Clips, and Fasteners: Comply with ASTM F 626 for polymer coating applied to exterior surfaces and, except inside cap shapes, to exposed interior surfaces.
1. Polymer Coating: Not less than 10-mil- (0.254-mm-) thick PVC.
- E. Color: Black complying with ASTM F 934.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.
 - 1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

- A. General: Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.
 - 1. Install fencing on established boundary lines inside property line or unless indicated otherwise on drawings.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.
- C. Post Setting: Hand-excavate holes for post foundations in firm, undisturbed or compacted soil. Set terminal, line, gate posts in concrete footing. Protect portion of posts aboveground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Using mechanical devices to set line posts per ASTM F 567 is permitted. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured.
 - 1. Dimensions and Profile: As indicated on Drawings.
 - 2. Exposed Concrete Footings: Extend concrete 2 inches (50 mm) above grade, smooth, and shape to shed water.
 - 3. Concealed Concrete Footings: Stop footings below grade as indicated on Drawings to allow covering with surface material.
 - 4. Posts Set into Concrete in Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.
 - 5. Posts Set into Concrete in Voids: Form or core drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.

3.4 CHAIN-LINK FENCE INSTALLATION

Use of tension wires versus top and bottom rails varies on this project depending on fence application. Refer to drawings for which fence requires tension wire and which fence requires top and bottom rail.

- A. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of as indicated on Drawings.
- B. Line Posts: Space line posts uniformly at 8 feet (2.44 m) o.c.
- C. Post Bracing Assemblies: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts. Locate horizontal braces at midheight of fabric on fences with top rail and at two-thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- D. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- (3.05-mm-) diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches (609 mm) o.c. Install tension wire in locations indicated before stretching fabric.
 - 1. Top Tension Wire: Install tension wire through post cap loops.
 - 2. Bottom Tension Wire: Install tension wire within 6 inches (150 mm) of bottom of fabric and tie to each post with not less than same gage and type of wire.
- E. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended by fencing manufacturer.
- F. Intermediate Rails: Install in one piece at as indicated on Drawings, spanning between posts, using fittings, special offset fittings, and accessories.
- G. Bottom Rails : Install, spanning between posts, using fittings and accessories. Refer to detail drawings for locations.
- H. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2 inches (50 mm) between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches (380 mm) o.c.
- J. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
 - 1. Maximum Spacing: Tie fabric to line posts 12 inches (304 mm) o.c. and to braces 24 inches (609 mm) o.c.
- K. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side.

3.5 GATE INSTALLATION

- A. General: Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 ADJUSTING

- A. Gate: Adjust gate to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

3.7 ACCESSORIES

- A. Install post caps and other accessories to complete fence.

3.8.1 CLEANING

- A. Clean up debris and unused material, and remove from site

END OF SECTION 323113

SECTION 329200 – LAWNS AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Lawns.

1.3 SUBMITTALS

Topsoil analysis

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer with a minimum of three years experience, who has completed seeding and sod work similar in scope to this Project and with a record of successful landscape establishment.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.
- B. Seed: Deliver seed in original sealed, labeled, and undamaged containers.
- C. Sod: Harvest, deliver, store, and handle sod according to the requirements of the American Sod Producers Association's (ASPA) "Specifications for Turfgrass Sod Materials and Transplanting/Installing."

1.6 PROJECT CONDITIONS

- A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required.
- B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before planting.

1.7 COORDINATION AND SCHEDULING

- A. Coordinate installation of planting materials during normal planting seasons (March 1st through October 1st), unless authorized in writing from the owner.

1.8 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Warrant the following living planting materials for a period of one year after date of Lawn acceptance, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor's control.
 - 1. Lawns

1.9 LAWN MAINTENANCE

- A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
 - 1. Seeded Lawns: 60 days after lawn is established and accepted.
 - a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established at that time, continue maintenance during next planting season.
 - b. When contractor feels the lawn areas are fully established there shall be a meeting on site for the owner to accept and the maintenance period shall start upon acceptance by owner.
 - 2. Sodded Lawns: 60 days after date of Lawn Acceptance.
- B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches. Temporary irrigation will not be in place for more than 12 months.
 - 1. Water lawn to ensure that when combined with rainfall the lawn is getting a minimum of 1 inch of water per week.
- D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the grass height. Remove no more than 40 percent 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.

- E. Postfertilization: Apply fertilizer to lawn after first mowing and when grass is dry.
 - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb per 1000 sq. ft. of lawn area.

PART 2 - PRODUCTS

2.1 GRASS MATERIALS

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.
 - 1. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on Schedules at the end of this Section.
- B. Sod: Certified turfgrass sod complying with ASPA specifications for machine-cut thickness, size, strength, moisture content, and mowed height, and free of weeds and undesirable native grasses. Provide viable sod of uniform density, color, and texture of the following turfgrass species, strongly rooted, and capable of vigorous growth and development when planted.
 - 1. Species: Provide Turf type fescue sod of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed to provide good quality lawn.

2.2 FERTILIZER

- 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-form, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- B. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The Contractor shall examine areas to receive lawns for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected. No installation of landscaping materials or topsoil shall be done while the soil is either frozen or water saturated.

3.2 PREPARATION

- A. Lay out locations, outline areas, and secure Architect's acceptance before the start of grassing. Make minor adjustments as may be required by Architect.

3.3 LAWN PLANTING PREPARATION

- A. Limit subgrade preparation to areas that will be planted in the immediate future.
- B. Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1-inch in any dimension and sticks, roots, rubbish, and other extraneous materials.
- C. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen.
 - 1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.
 - 2. Allow for sod thickness in areas to be sodded.
- D. Preparation of Unchanged Grades: Where lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare soil as follows:
 - 1. Remove and dispose of existing grass, vegetation, and turf. Do not turn over into soil being prepared for lawns.
 - 2. Till surface soil to a depth of at least 6 inches. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches of soil. Trim high areas and fill in depressions. Till soil to a homogenous mixture of fine texture.
 - 3. Clean surface soil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - 4. Remove waste material, including grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- E. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1 inch in any dimension, and other objects that may interfere with planting or maintenance operations.
- F. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.4 SEEDING NEW LAWNS

- A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
- B. Sow seed at the following rates:
 - 1. Seeding Rate: 5 to 8 lb per 1000 sq. ft..
- C. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.

- D. Protect seeded slopes exceeding 1:4 against erosion with erosion-control blankets installed and stapled according to manufacturer's recommendations.
- E. Protect seeded slopes exceeding 1:6 against erosion with jute or coir-fiber erosion-control mesh installed and stapled according to manufacturer's recommendations.
- F. Protect seeded areas with slopes less than 1:6 against erosion by spreading straw mulch after completion of seeding operations. Spread uniformly at a minimum rate of 2 tons per acre to form a continuous blanket 1-1/2 inches loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Anchor straw mulch by crimping into topsoil by suitable mechanical equipment.
- G. Protect seeded areas against hot, dry weather or drying winds by applying peat mulch within 24 hours after completion of seeding operations. Soak and scatter uniformly to a depth of 3/16 inch thick and roll to a smooth surface.

3.5 HYDROSEEDING NEW LAWNS

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.
 - 1. Mix slurry with nonasphaltic tackifier.
 - 2. Apply slurry uniformly to all areas to be seeded in a 1-step process. Apply mulch at the minimum rate of 1500 lb per acre dry weight but not less than the rate required to obtain specified seed-sowing rate.

3.6 SODDING NEW LAWNS

- A. Lay sod within 24 hours of stripping. Do not lay sod if dormant or if ground is frozen.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across angle of slopes exceeding 1:3.
 - 2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within 2 hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below the sod.

3.7 RECONDITIONING LAWNS

- A. Recondition existing lawn areas damaged by Contractor's operations, including storage of materials or equipment and movement of vehicles. Also recondition lawn areas where settlement or washouts occur or where minor regrading is required.

1. Recondition other existing lawn areas.
- B. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
- C. Where substantial lawn remains, mow, dethatch, core aerate, and rake. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- D. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- E. Till stripped, bare, and compacted areas thoroughly to a depth of 6 inches.
- F. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches of soil. Provide new planting soil as required to fill low spots and meet new finish grades.
- G. Apply seed and protect with straw mulch as required for new lawns.
- H. Apply sod as required for new lawns.
- I. Water newly planted areas and keep moist until new grass is established.

3.8 INSTALLATION OF MISCELLANEOUS MATERIALS

- A. Apply antidesiccant using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage.
 1. When deciduous trees or shrubs are moved in full-leaf, spray with antidesiccant at nursery before moving and again 2 weeks after planting.

3.9 CLEANUP AND PROTECTION

- A. During landscaping, keep pavements clean and work area in an orderly condition.
- B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

3.11 SEEDING SCHEDULE

- A. **Lawn Area Seed Mix:** Seed shall be a blend of Turf Type Tall Fescue with perennial and annual rye:

Provide a minimum of two types of Turf Type Fescue from the following list with Falcon II, Hounddog 5, Finelawn Petite, and Crossfire II or as recommended by local county extension agent.

SEED MIXTURES SCHEDULE

Proportion	Name	Min. Pct. Germ.	Min. Pct. Pure Sd.	Max. Pct. Weed Sd.
85 pct.	Turf Type Fescue	85	85	0.50
5 pct.	Bluegrass	85	85	0.50
10 pct.	Annual Rye Grass	85	90	0.50

SATISFACTORY 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 95% over any 10 sq. ft. and bare spots not exceeding 2" by 2". Contractor will not be paid until acceptable turf is established.

Contractor shall notify Landscape Architect and Owner when maintenance period is complete and solid stand of grass is established. The purpose of this notification is to ensure that there is no lapse between contractor maintenance and date when owner accepts and takes over maintenance of lawn areas. Contractor shall provide notification and maintenance acceptance letter for approval and shall not stop maintenance operations until acceptance letter is signed by Owner

END OF SECTION 329200

SECTION 329300 – LANDSCAPE PLANTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Trees.
 - 2. Shrubs.
 - 3. Ground covers.
 - 4. Plants.
 - 5. Topsoil and soil amendments.
 - 6. Fertilizers and mulches.
 - 7. Landscape edgings.

1.3 SUBMITTALS

None Required

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer with a minimum of three years experience, who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress.
- B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- C. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with requirements of ANSI Z60.1 "American Standard for Nursery Stock" as a minimum.
- D. Inspection of plants: The Landscape Architect shall inspect trees and shrubs for compliance with requirements for genus, species, variety, size, condition and quality. The Landscape Architect retains the right to inspect plant material for injuries, insects, size of root balls and root systems and to reject unsatisfactory or defective material at any time during the project. Contractor shall schedule with Landscape Architect for inspection of plants prior to delivery to the jobsite. Travel expenses for travel over 30 miles shall be paid for by the contractor

- E. Topsoil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of topsoil.
 - 1. Report suitability of topsoil for growth of applicable planting material. State recommended quantities of nitrogen, phosphorus, and potash nutrients and any limestone, aluminum sulfate, or other soil amendments to be added to produce a satisfactory topsoil.
- F. Measurements: Measure trees and shrubs according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above ground for trees up to 2-inch caliper size,. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.
- B. Trees and Shrubs: Deliver freshly dug trees and shrubs. Do not prune before delivery, except as approved by Architect. Protect bark, branches, and root systems from sunscald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop trees and shrubs during delivery.
- C. Handle balled and burlapped stock by the root ball.
- D. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist.
 - 1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 2. Do not remove container-grown stock from containers before time of planting.
 - 3. Water root systems of trees and shrubs stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.6 PROJECT CONDITIONS

- A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required.
- B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before planting.

1.7 COORDINATION AND SCHEDULING

- A. Coordinate installation of planting materials during normal planting seasons (February 1st- April 15th and Sept 1st- Dec. 15th.), unless authorized in writing from the owner.

1.8 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Warrant the following living planting materials for a period of one year after date of Substantial Completion, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor's control.
 - 1. Trees.
 - 2. Shrubs.
 - 3. Ground covers.
 - 4. Plants.
- C. Remove and replace dead planting materials immediately unless required to plant in the succeeding planting season.
- D. Replace planting materials that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
- E. A limit of one replacement of each plant material will be required, except for losses or replacements due to failure to comply with requirements.

1.9 TREE AND SHRUB MAINTENANCE

- A. Maintain trees and shrubs by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease.
- B. Maintain trees and shrubs for the following period:
 - 1. Maintenance Period: 60 days following Substantial Completion.

1.10 GROUND COVER AND PLANT MAINTENANCE

- A. Maintain ground cover and plants by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings for the following period:
 - 1. Maintenance Period: 60 days following Substantial Completion.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

- A. General: Furnish nursery-grown trees and shrubs conforming to ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully-branched,

healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

- B. Grade: Provide trees and shrubs of sizes and grades conforming to ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.
- C. Label at least 1 tree and 1 shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.

2.2 SHADE AND FLOWERING TREES

- A. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required.
 - 1. Branching Height: 1/3 to 1/2 of tree height.
- B. Small Trees: Small upright or spreading type, branched or pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1, and stem form as follows:
 - 1. Form: Single stem.
 - 2. Form: Multistem, clump, with 2 or more main stems.
 - 3. Form: Multistem, shrub, with multiple stems.
- C. Provide balled and burlapped trees.
 - 1. Container-grown trees will be acceptable in lieu of balled and burlapped trees subject to meeting ANSI Z60.1 limitations for container stock.

2.3 DECIDUOUS SHRUBS

- A. Form and Size: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.
- B. Provide balled and burlapped deciduous shrubs.
 - 1. Container-grown deciduous shrubs will be acceptable in lieu of balled and burlapped deciduous shrubs subject to meeting ANSI Z60.1 limitations for container stock.

2.4 CONIFEROUS EVERGREENS

- A. Form and Size: Normal-quality, well-balanced, coniferous evergreens, of type, height, spread, and shape required, conforming to ANSI Z60.1.
- B. Provide balled and burlapped coniferous evergreens.
 - 1. Container-grown coniferous evergreens will be acceptable in lieu of balled and burlapped coniferous evergreens subject to meeting ANSI Z60.1 limitations for container stock.

2.5 BROADLEAF EVERGREENS

- A. Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, conforming to ANSI Z60.1.
- B. Provide balled and burlapped broadleaf evergreens.
 - 1. Container-grown broadleaf evergreens will be acceptable in lieu of balled and burlapped broadleaf evergreens subject to meeting ANSI Z60.1 limitations for container stock.

2.6 GROUND COVERS AND PLANTS

- A. Provide ground covers and plants established and well rooted in removable containers or integral peat pots and with not less than the minimum number and length of runners required by ANSI Z60.1 for the pot size indicated.

2.7 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones **1 inch (25 mm)** or larger in any dimension, and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Reuse surface soil on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - 2. Topsoil Source: Import topsoil from off-site sources. Obtain topsoil from naturally well-drained sites where topsoil occurs at least **4 inches (100 mm)** deep; do not obtain from bogs or marshes.

2.8 SOIL AMENDMENTS

- A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a **No. 8 (2.36 mm)** sieve and a minimum 75 percent passing a **No. 60 (250 micrometer)** sieve.
 - 1. Provide lime in the form of dolomitic limestone.
- B. Aluminum Sulfate: Commercial grade, unadulterated.
- C. Sand: Clean, washed, natural or manufactured sand, free of toxic materials.
- D. Perlite: Horticultural perlite, soil amendment grade.
- E. Peat Humus: Finely divided or granular texture, with a pH range of 6 to 7.5, composed of partially decomposed moss peat (other than sphagnum), peat humus, or reed-sedge peat.
- F. Peat Humus: For acid-tolerant trees and shrubs, provide moss peat, with a pH range of 3.2 to 4.5, coarse fibrous texture, medium-divided sphagnum moss peat or reed-sedge peat.
- G. Pine Fines: Ground pine bark with particle sizes ranging from ¼ inch to ½ inch maximum for use as a soil conditioner

- H. Sawdust or Ground-Bark Humus: Decomposed, nitrogen-treated, of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
 - 1. When site treated, mix with at least 0.15 lb (2.4 kg) of ammonium nitrate or 0.25 lb (4 kg) of ammonium sulfate per cu. ft. (cu. m) of loose sawdust or ground bark.
- I. Manure: Well-rotted, unleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.
- J. Herbicides: EPA registered and approved, of type recommended by manufacturer.
- K. Water: Potable.

2.9 FERTILIZER

- A. Bonemeal: Commercial, raw, finely ground; minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; minimum of 20 percent available phosphoric acid.
- C. 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-form, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- D. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.10 MULCHES

- A. Organic Mulch: Organic mulch, free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - 1. Type: Shredded hardwood.
 - 2. Type: Ground or shredded bark.
- B. Peat mulch may be required when plantings and seeded lawns are subjected to hot, dry weather or drying winds within 30 days of planting. Delete if not required.

2.11 MISCELLANEOUS MATERIALS

- A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The Contractor shall examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected. No installation of landscaping materials or topsoil shall be done while the soil is either frozen or water saturated.

3.2 PREPARATION

- A. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, and secure Architect's acceptance before the start of planting work. Make minor adjustments as may be required by Architect.

3.3 PLANTING SOIL PREPARATION

- A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
- B. Mix soil amendments and fertilizers with topsoil at rates indicated. Delay mixing fertilizer if planting does not follow placing of planting soil within a few days.
- C. For tree pit or trench backfill, mix planting soil before backfilling and stockpile at site.
- D. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.
 - 1. Mix lime with dry soil prior to mixing fertilizer. Prevent lime from contacting roots of acid-tolerant plants.
 - 2. Apply phosphoric acid fertilizer, other than that constituting a portion of complete fertilizers, directly to subgrade before applying planting soil and tilling.

3.4 ANNUAL BED PREPARATION

- A. Mark areas indicated for annuals on the plan.
- B. Loosen subgrade of planting bed areas to a minimum depth of 6 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous materials.
- C. Spread top soil to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of topsoil.
- D. Till into soil, 15% by volume soil conditioner to a minimum depth of 8 inches
- E. Install herbicide at manufacturers recommended rates to all annual bed areas.

3.5 GROUND COVER AND PLANT BED PREPARATION

- A. Loosen subgrade of planting bed areas to a minimum depth of 6 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous materials.
- B. Spread top soil to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of topsoil with soil conditioner added.
- C. Till into soil, 15% by volume soil conditioner to a minimum depth of 8 inches.

3.6 EXCAVATION FOR TREES AND SHRUBS

- A. Pits and Trenches: Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. Loosen hard subsoil in bottom of excavation.
 - 1. Balled and Burlapped Trees and Shrubs: Excavate approximately 1-1/2 times as wide as ball diameter and equal to ball depth, plus the following setting layer depth:
 - a. Setting Layer: Allow 3 inches of planting soil.
 - 2. Container-Grown Trees and Shrubs: Excavate to container width and depth, plus the following setting-layer depth:
 - a. Setting Layer: Allow 3 inches of planting soil.
 - 3. Where drain tile is shown or required under planted areas, excavate to top of porous backfill over tile.
- B. Dispose of subsoil removed from landscape excavations. Do not mix with planting soil or use as backfill.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
 - 1. Hardpan Layer: Drill 6-inch diameter holes into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

3.7 PLANTING TREES AND SHRUBS

- A. Set balled and burlapped stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.
 - 1. Place stock on setting layer of compacted planting soil.
 - 2. Remove burlap from tops of balls and partially from sides, but do not remove from under balls. Remove wire baskets completely. Remove pallets, if any, before setting. Do not use planting stock if ball is cracked or broken before or during planting operation.
 - 3. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of backfill.

- B. Set container-grown stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.
 - 1. Carefully remove containers so as not to damage root balls.
 - 2. Place stock on setting layer of compacted planting soil.
 - 3. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.
- C. Dish and tamp top of backfill to form a 3-inch- (75-mm-) high mound around the rim of the pit. Do not cover top of root ball with backfill.

3.8 TREE AND SHRUB PRUNING

- A. Prune, thin, and shape trees and shrubs as directed by Architect.
- B. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by Architect, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are size after pruning.

3.9 PLANTING GROUND COVER AND PLANTS

- A. Space ground cover and plants as indicated.
- B. Dig holes large enough to allow spreading of roots, and backfill with planting soil. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

3.10 MULCHING

- A. Mulch backfilled surfaces of pits, trenches, planted areas, and other areas indicated.
- B. Weed-Control: Install the weed-control Herbicides according to manufacturer's recommendations, before mulching. Completely cover area to be mulched.
- C. Organic Mulch: Apply the following average thickness of organic mulch and finish level with adjacent finish grades. Do not place mulch against trunks or stems.
 - 1. Thickness: 2 inches or as shown on the plans.

3.11 INSTALLATION OF MISCELLANEOUS MATERIALS

- A. Apply antidesiccant using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage.
 - 1. When deciduous trees or shrubs are moved in full-leaf, spray with antidesiccant at nursery before moving and again 2 weeks after planting.

3.12 CLEANUP AND PROTECTION

- A. During landscaping, keep pavements clean and work area in an orderly condition.
- B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.13 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION 329300

SECTION 330513 - MANHOLES AND STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Monolithic concrete manholes with masonry transition to lid frame, covers, anchorage, and accessories.
- B. Modular precast concrete manhole sections with tongue-and-groove joints with masonry transition to lid frame, covers, anchorage, and accessories.
- C. Monolithic FRP manholes with transition to lid frame, covers, anchorage, and accessories.
- D. Masonry manhole sections with masonry transition to lid frame, covers, anchorage, and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete.
- B. Section 042000 - Unit Masonry: Masonry units and mortar and grout.

1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 012200 - Unit Prices, for additional unit price requirements.

1.04 REFERENCE STANDARDS

- A. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 2005.
- B. ASTM A 48/A 48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2008).
- C. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2002.
- D. ASTM C 55 - Standard Specification for Concrete Brick; 2006.
- E. ASTM C 478 - Standard Specification for Precast Reinforced Concrete Manhole Sections; 2009.
- F. ASTM C 478M - Standard Specification for Precast Reinforced Concrete Manhole Sections [Metric]; 2009.
- G. ASTM C 923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals; 2008.
- H. ASTM C 923M - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals [Metric]; 2008b.
- I. ASTM C 1634 - Standard Specification for Concrete Facing Brick; 2006.
- J. ASTM D 3753 - Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells; 2005.
- K. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; 1993.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

- B. Shop Drawings: Indicate manhole locations, elevations, piping sizes and elevations of penetrations.
- C. Product Data: Provide manhole covers, component construction, Lettering requirements for Manhole Lids, features, configuration, and dimensions.

1.06 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.07 FIELD CONDITIONS

- A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Manhole Sections: Reinforced precast concrete in accordance with ASTM C 478 (ASTM C 478M), with resilient connectors complying with ASTM C 923 (ASTM C 923M).
- B. Manhole Sections: ASTM D 3753, glass-fiber reinforced polyester with integral steps.
- C. Concrete: As specified in Section 033000.
- D. Mortar and Grout: As specified in Section 042000, Type S.
- E. Concrete Reinforcement: As specified in Section 033000.

2.02 COMPONENTS

- A. Lid and Frame: ASTM A 48/A 48M, Class 30B Cast iron construction, machined flat bearing surface, removable lockable lid, closed lid design; live load rating of meeting or exceeding H-20 loading; sealing gasket; lid molded with identifying name ;.
- B. Manhole Steps: Formed galvanized steel rungs; 3/4 inch diameter. Formed integral with manhole sections.

2.03 CONFIGURATION

- A. Shaft Construction: Concentric with concentric cone top section; lipped male/female joints; sleeved to receive pipe sections.
- B. Shape: Cylindrical.
- C. Clear Inside Dimensions: 48 inch minimum diameter.
- D. Design Depth: As indicated.
- E. Clear Lid Opening: 26 inches diameter.
- F. Pipe Entry: Provide openings as indicated.
- G. Steps: As required by local code and details of authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify items provided by other sections of Work are properly sized and located.
- B. Verify that built-in items are in proper location, and ready for roughing into Work.

- C. Verify excavation for manholes is correct.

3.02 PREPARATION

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.03 MANHOLES

- A. Place concrete base pad, trowel top surface level.
- B. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.
- C. Form and place manhole cylinder plumb and level, to correct dimensions and elevations. As work progresses, build in connections as necessary.
- D. Cut and fit for pipe.
- E. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.
- F. Set cover frames and covers level without tipping, to correct elevations.
- G. Coordinate with other sections of work to provide correct size, shape, and location.

3.04 MASONRY WORK

- A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- B. Lay masonry units in running bond. Course one unit and one mortar joint to equal 8 inches.
- C. Form concave mortar joints.
- D. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- E. Install joint reinforcement 16 inches on center.
- F. Place joint reinforcement in first and second horizontal joints above base pad and below lid frame opening.

3.05 SCHEDULES

- A. Storm Sewer Manholes: Precast concrete sections, galvanized steel steps, 48 inch inside dimension, to depth indicated, with bolted lid.
- B. Electric Service Manholes: Prefabricated FRP sections, integral molded steps, 60 inch inside dimension, to depth indicated.

END OF SECTION

SECTION 334111 - SITE STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Storm drainage piping, fittings, and accessories.
- B. Connection of drainage system to municipal sewers.
- C. Catch basins, Plant area drains, Paved area drainage, Site surface drainage, Detention tank, and Detention basin.

1.02 RELATED REQUIREMENTS

- A. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 012200 - Unit Prices, for additional unit price requirements.

1.04 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.05 REFERENCE STANDARDS

- A. ASTM A 74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2006.
- B. ASTM C 14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe; 2007.
- C. ASTM C 14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe [Metric]; 2007.
- D. ASTM C 76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2008.
- E. ASTM C 76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe [Metric]; 2008a.
- F. ASTM C 443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2005a.
- G. ASTM C 443M - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric); 2007.
- H. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2003a.
- I. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2006.
- J. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2008.
- K. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2003.
- L. ASTM D 2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; 2005.

- M. ASTM D 3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2006.

1.06 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Project Record Documents:
 - 1. Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.
 - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the Work of this section.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

- A. Cast Iron Soil Pipe: ASTM A 74, Extra Heavy grade, inside nominal diameter as shown on plans, hub and spigot end.
- B. Cast Iron Pipe Joint Device: ASTM C 564, rubber gasket joint devices.
- C. Concrete Pipe: Reinforced, ASTM C 76 (ASTM C 76M), Class III with Wall type A; mesh reinforcement; inside nominal diameter as shown on plans, bell and spigot end joints.
- D. Reinforced Concrete Pipe Joint Device: ASTM C 443 (ASTM C 443M) rubber compression gasket joint.

2.02 PIPE ACCESSORIES

- A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.
- B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.
- C. Filter Fabric: Non-biodegradable, woven.
- D. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Storm Sewer Service " in large letters.

2.03 CATCH BASIN, CLEANOUT, AND AREA DRAIN COMPONENTS

- A. Lids and Drain Covers: Cast iron, hinged to cast iron frame. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
 - 1. Catch Basin:
 - a. Lid Design: Per Details on plans.
 - 2. Cleanout:
 - a. Lid Design: Per Details on plans.
 - 3. Area Drain:
 - a. Lid Design: Per Details on plans.
- B. Shaft Construction and Concentric Cone Top Section: Reinforced precast concrete pipe sections, lipped male/female dry joints, nominal shaft diameter of as required for construction.

2.04 BEDDING AND COVER MATERIALS

- A. Bedding: As specified in Section 312316.13.

- B. Cover: As specified in Section 312316.13.

PART 3 EXECUTION

3.01 TRENCHING

- A. See Section 312316.13 for additional requirements.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.
- C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION - PIPE

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
 - 1. Plastic Pipe: Also comply with ASTM D 2321.
- C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- D. Connect to building storm drainage system, foundation drainage system, and utility/municipal sewer system.
- E. Install continuous trace wire 6 inches above top of pipe; coordinate with Section 312316.13.

3.03 INSTALLATION - CATCH BASINS AND CLEANOUTS

- A. Installation of precast catch basins preferred.
- B. Form bottom of excavation clean and smooth to correct elevation.
- C. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.
- D. Establish elevations and pipe inverts for inlets and outlets as indicated.
- E. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.04 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 014000.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
 - 1. Pressure Test: Test in accordance with authorities having jurisdiction.
 - 2. Infiltration Test: Test in accordance with authorities having jurisdiction.
 - 3. Deflection Test: Test in accordance with authorities having jurisdiction.

3.05 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 334600 - SUBDRAINAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Building Perimeter, Retaining Wall, and Under-Slab Drainage Systems.
- B. Filter aggregate and fabric and bedding.

1.02 RELATED REQUIREMENTS

- A. Section 312316 - Excavation: Excavating for subdrainage system piping and surrounding filter aggregate.
- B. Section 312323 - Fill: Backfilling over filter aggregate, up to subgrade elevation.
- C. Section 312316.13 - Trenching: Excavating and backfilling for site subdrainage systems.

1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 012200 - Unit Prices, for additional unit price requirements.

1.04 REFERENCE STANDARDS

- A. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2003.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe drainage products and pipe accessories.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the work of this section.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

- A. Manufacturers:
 - 1. Substitutions: See Section 016000 - Product Requirements.
- B. Polyvinyl Chloride Pipe: ASTM D 2729; plain end, 4 inch inside diameter; with required fittings.
- C. Corrugated Plastic Tubing: Flexible type; 4 inch diameter, with required fittings.
- D. Use perforated pipe at subdrainage system; unperforated through sleeved walls.

2.02 AGGREGATE AND BEDDING

- A. Filter Aggregate and Bedding Material: Granular fill as specified in Section 312323.

2.03 ACCESSORIES

- A. Pipe Couplings: Solid plastic.
- B. Filter Fabric: Water pervious type, black polyolefin.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are

SUBDRAINAGE

PAYNEVILLE ELEMENTARY SCHOOL RENOVATION AND ADDITION

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as indicated on layout Drawings.

3.02 PREPARATION

- A. Remove large stones or other hard matter that could damage drainage piping or impede consistent backfilling or compaction.

3.03 INSTALLATION

- A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions.
- B. Place drainage pipe on clean cut subsoil.
- C. Lay pipe to slope gradients noted on Drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- D. Place pipe with perforations facing down. Mechanically join pipe ends.
- E. Install pipe couplings.
- F. Install filter aggregate at sides, over joint covers and top of pipe. Provide top cover compacted thickness of 12 inches.
- G. Place filter fabric over levelled top surface of aggregate cover prior to subsequent backfilling operations.
- H. Place aggregate in maximum 4 inch lifts, consolidating each lift.
- I. Refer to Section 312323 for compaction requirements. Do not displace or damage pipe when compacting.
- J. Place impervious fill over drainage pipe aggregate cover and compact.
- K. Coordinate the Work with connection to municipal sewer utility service, and trenching.

3.04 FIELD QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Field inspection and testing.

3.05 PROTECTION

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.

END OF SECTION

SECTION 334900 - STORM DRAINAGE STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This Section includes storm drainage outside the building..

1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 012000 - Price and Payment Procedures: Applications for payment, Schedule of Values, modifications procedures, closeout procedures.
- C. Section 012200 - Unit Prices: Descriptions of unit price items, administrative requirements.
- D. Section 015713 - Temporary Erosion and Sedimentation Control.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Unit Prices: See Section 012200 - Unit Prices, for additional unit price requirements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate Typical precast structure.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sherman Dixie Precast Concrete Products, Lexington, KY
- B. Cloud / Oldcastle Concrete

2.02 CATCH BASINS AND MANHOLES

- A. Precast Concrete Catch Basins and Manholes: ASTM C 478, precast, reinforced concrete, of depth shape and dimensions indicated, with provision for rubber gasketed joints, and as required by authorities having jurisdiction
- B. Cast-in-Place Concrete, Catch Basins and Manholes: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.
 - 1. Bottom, Walls, and Top: Reinforced concrete.
 - 2. Channels and Benches: Concrete.
- C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service, unless otherwise shown on the drawings. Include flat grate with small square or short-slotted drainage openings.

2.03 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening per plans and details, of materials and dimensions according to plans, details, and utility standards.
- B. Gutter Inlets: Made with horizontal gutter opening, per plans and details, of materials and dimensions according to plans, details, and utility standards. Include heavy-duty frames and grates.
- C. Combination Inlets: Made with vertical curb and horizontal gutter openings per plans and details, of materials and dimensions according to plans, details, and utility standards. Include heavy-duty frames and grates.
- D. Frames and Grates: Heavy duty

2.04 CLEANOUTS

- A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:
 - 1. Light Duty: In earth or grass foot-traffic areas.
 - 2. Medium Duty: In paved foot-traffic areas.
 - 3. Heavy Duty: In vehicle-traffic service areas.
 - 4. Extra-Heavy Duty: In roads.
 - 5. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.
- B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.05 DRAINS

- A. Gray-Iron Area Drains: ASME A112.21.1M, round, gray-iron body with anchor flange and round, secured, gray-iron grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated. Use units with top-loading classifications according to the following applications:
 - 1. Medium Duty: In paved foot-traffic areas.
 - 2. Heavy Duty: In vehicle-traffic service areas.

2.06 PIPE OUTLETS

- A. Head Walls: Cast-in-place or precast reinforced concrete, with apron (as shown on the drawings.)

- B. Riprap Basins: Broken, irregular size and shape, graded stone.
 - 1. Average Size: KTC, Class II channel lining.
- C. Filter Stone: KTC #8, #9 or 9M graded stone.
- D.

PART 3 EXECUTION

3.01 INSTALLERS

- A. Installer List: Qualified installers shall be contractors who have successfully installed and performed on 5 previous similar scale projects

3.02 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
- B. Embed drains in 4-inch (100-mm) minimum depth of concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.

3.03 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 4 inches (450 by 450 by 100 mm) deep. Set with tops flush with the surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.04 TAP CONNECTIONS

- A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.
- B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
- C. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
- D. Make branch connections from side into existing piping, NPS 21 or larger, or to underground structures by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
 - 1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
 - 2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
 - 3. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.05 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with at least 8-inch- thick, brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Structures: Excavate around structure as required and use one procedure below:

END OF SECTION

SECTION 461313 – UNDERGROUND PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Furnishing pipe, fittings, valves and appurtenances for water, wastewater and process flow.
- B. Furnishing miscellaneous appurtenances.
- C. Installation.
- D. Testing.

1.2 GENERAL REQUIREMENTS

- A. All products included in this Section shall conform to the requirements of the standard specifications referenced herein.
- B. Pipe size shall be as shown on the Drawings.
- C. All pipe shall be restrained push-on joint or mechanical joint ductile iron pipe with retainer glands unless noted otherwise on the Drawings.
- D. The underground piping shall be installed as shown on the Drawings.

1.3 RELATED SECTIONS

The specification sections listed below are an integral part of this specification and the Contractor shall be responsible for coordinating and providing these sections to other subcontractors.

- A. Section 312000 - EARTHWORK

1.4 SUBMITTALS

- A. Shop Drawings - for piping, fittings and other appurtenances shall be prepared and submitted in accordance with The General Conditions. Shop drawings shall show complete piping layout, including materials, sizes, classes, locations, necessary dimensions, supports, etc. No fabrication or installation shall begin until shop drawings are approved by the Engineer.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. Ductile Iron Pipe and Fittings - All yard piping whether it be gravity or forced shall be ductile iron unless otherwise specified. Ductile iron pipe shall meet the requirements of ANSI/AWWA C151/A21.51, Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids. Unless otherwise noted on the Plans or in the Contract Documents, the thickness class shall be determined based on a working pressure of 150 psi, in accordance with ANSI/AWWA C150/A21.50, Thickness Design for Ductile Iron Pipe. The minimum class thickness shall be 50 unless a higher class is required by ANSI/AWWA C150/A21.50.

All fittings shall be Ductile Iron unless otherwise noted on the Drawings. Ductile Iron Fittings shall meet the requirements of ANSI/AWWA C110/A21.10, Ductile Iron and Gray Iron Fittings, 3-Inch through 48-Inch for Water and Other Liquids or ANSI/AWWA C153/A21.53, Ductile Iron and Gray Iron Compact Fittings 3-inch through 12-inch, for water and other liquids. Unless shown otherwise on the Plans or the Contract Documents, Class 250 fittings shall be used. All fittings shall be mechanical joint with wedge action retainer glands. Mechanical joint restraint shall

be incorporated into the design of the follower gland.

All pipe and fittings shall be cement-lined in accordance with ANSI/AWWA C104/A21.4, Cement-Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings. Ductile Iron Pipe and Fittings shall be coated on the outside with an Asphaltic Coating as specified in AWWA C151/A21.51 and AWWA C110/A21.10.

Joints shall be push-on rubber gasket types which meet the requirements of ANSI/AWWA C111/A21.11, Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings. All Ductile Iron Fittings Joints shall be the Mechanical Joint type conforming to ANSI/AWWA C111/A21.11 and shall include Retainer Glands.

All Ductile Iron Pipe and Fittings shall be encased in 8 millimeter polyethylene in accordance with ANSI/AWWA C105/A21.5 Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.

All Ductile Iron Pipe and Fittings used for air or blower piping shall not be bituminous coated on the inside and shall not be cement lined. All coatings, baskets, hardware, etc., used on air or blower piping shall be rated for continuous operation at 250°F.

- B. Polyvinyl Chloride (PVC) Pipe and Fittings - Unless shown otherwise on the Plans, in the Contract Documents, or stipulated by the Engineer, the Contractor shall use PVC pipe meeting the requirements of ASTM D 3034, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings. Unless shown otherwise on the Plans or in the Contract Documents, SDR 35 pipe shall be required.

Polyvinyl Chloride Pipe shall be installed in accordance with these Specifications and ASTM Standards for "Underground Installation of Flexible Thermoplastic Sewer Pipe", D2321.

Joints for PVC pipe shall be gasketed, bell and spigot, push-on types which meet the requirements of ASTM D 3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals. Gaskets shall meet the requirements of ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

- C. Polyvinyl Chloride (PVC) Pressure Pipe

1. Pipes: PVC pressure pipe shall conform to ASTM Specification D-2241, Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe (SDR PR). The material used shall conform to ASTM Specification D-1784, Standard Specification of Rigid Polyvinyl Chloride and Chlorinated Polyvinyl Chloride compounds, Class 12454-B (PVC 1120). The minimum pressure class/SDR rating acceptable shall be Class 200/SDR 21.

The pipe fittings shall be ductile iron as previously specified with suitable wedge action retainer glands.

All plastic pipe and couplings shall bear identification markings in accordance with Sections 2.5.2 and 2.5.3 of AWWA C-900-75, which shall include the National Sanitation Foundation (NSF) seal of approval. In addition, the plain end of each pipe length shall have two (2) rings, one (1) inch apart, painted around the pipe at the proper location to allow field checking of the correct setting depth of the pipe in the bell or coupling.

2. Joints: Joints shall be bell end or coupling push-on type. The push-on joint and joint components shall meet the requirements for ASTM Specification D-3139, Joint for the Plastic Pressure Pipe, using Flexible Elastomeric Seals. The joint shall be designed so as to provide for the thermal expansion and contraction

experienced with a total temperature change of seventy-five (75) degrees F in each joint of pipe. Details of the joint design and assembly shall be in accordance with joint manufacturer's standard practice. The lubricant shall have no deteriorating effects on the gasket or the pipe. The lubricant containers shall be labeled with manufacturer's name. Gaskets shall meet all applicable requirements of ANSI Standard A-21.11.

3. Fittings: Fittings shall be ductile iron as previously specified.
4. Installation: The installation shall conform to the requirements of the manufacturer, the AWWA Standard and as indicated on the plans and specified herein.

2.2 MISCELLANEOUS

- A. Plug Valves - Plug valves shall be nonlubricated, eccentric type and shall close droptight at the rated pressure of 150 psig. Port areas shall be the full pipe area to provide clog-free operation. The valve body shall be cast iron or semi-steel with a welded-in-place nickel seat. The body shall have a bolted bonnet for permitting removal of the plug while body remains in line. Flanges shall be 125-pound, faced, and drilled. The plug shall be cast iron with synthetic rubber facing, suitable for frequent open-close operation and for flow throttling.

All plug valves shall be supplied with activators complete with 2" square operating nut. Valves and activators shall be rated for below grade service.

Journal bearings shall be provided at each end of the plug and shall be of the wetted type to prevent binding. Bearings shall be fabricated from oil-impregnated 316 stainless steel so that the plug will operate freely after long periods of inactivity. Packing shall be adjustable U-rings, and shall be capable of being replaced under pressure without removal of the bonnet or plug. Valves shall be provided with adjustable stops.

Unless otherwise specified, valves shall be installed so that when closed, the plug is at the upstream end of the valve. In horizontal piping with the plug shaft installed horizontally, the plug shall be in the upper part of the valve body when open.

Plug valves shall be as manufactured by Val-matic, Clow, Homsted, or equal.

Exterior surfaces of the valves shall be coated with two coats of coal tar epoxy paint before installation.

Each valve shall be furnished with a two-piece cast iron adjustable valve box with cover. The valves shall have extension stems which place the 2-inch square operating nut 6 inches below the top of the valve box. Cast iron valve box extensions shall be provided.

Contractor may use resilient seat gate valves in lieu of plug valves as specified in Section 15120.

- B. Couplings - Shall be cast iron with stainless steel bolts and nuts. The couplings shall receive two coats of coal tar epoxy paint on all exterior surfaces prior to installation.

PART 3 - EXECUTION

3.1 GENERAL

- A. Pipe and accessories shall be handled in such a manner as to insure that pipe is installed in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating or lining (if any).
- B. Any pipe showing a distinct crack with no evidence of incipient fracture beyond the limits of the visible crack, if approved, may have the cracked portion cut off by, and

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at the expense of, the Contractor before the pipe is laid so that the pipe used is perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack.

- C. Cutting of the pipe shall be done in a neat and workmanlike manner without damage to the pipe lining. Unless otherwise authorized by the Engineer, all pipe cutting shall be done by means of an approved type of power cutter. The use of hammer and chisel, or any other method which results in rough edges, chipped or damaged pipe, is prohibited.
- D. Each pipe section shall be placed into position in the trench in such manner and by such means required to cause no injury to the pipe, persons, or to any property.
- E. The Contractor shall furnish slings, straps, and/or approved devices to provide satisfactory support of the pipe when it is lifted. Transportation from storage areas to the trench shall be restricted to operations which can cause no damage to the pipe or lining.
- F. The pipe shall not be dropped from trucks onto the ground or into the trench.
- G. The Contractor shall have on the job site which each pipe laying crew, all the proper tools to handle and cut the pipe.
- H. Damaged pipe coating and/or lining shall be restored before installation as approved by the Engineer.

3.2 CONTROL OF ALIGNMENT AND GRADE

- A. Easement and property and other control lines necessary for locating the work as well as elevations used in the design of the work are shown on the Drawings. The Contractor shall use this information to set line and use a level or transit to set grade.
- B. The Contractor may use laser equipment to assist in setting the pipe provided he can demonstrate satisfactory skill in its use.
- C. The use of string levels, hand levels, carpenter's levels or other relatively crude devices for transferring grade or setting pipe are not to be permitted.
- D. The Contractor shall carefully preserve benchmarks, reference points and stakes, and in case of willful or careless destruction by his own men, he will be charged with the resulting expense to re-establish such destroyed control data and shall be responsible for any mistakes or delay that may be caused by the unnecessary loss or disturbance of such control data.

3.3 PREPARATION OF BED

- A. As soon as excavation has been completed to required depth, place and compact bedding materials as shown on the Contract Drawings and specified in Section 02160, Earthwork, to the elevation necessary to bring the pipe to grade.
- B. The compacted bedding material shall be rounded so that at least the bottom quadrant of the pipe shall rest firmly on the bedding for the full length of the barrel. Suitable holes for bells or couplings shall be dug around the pipe joints to provide ample space for making tight joints.

3.4 LAYING PIPE

- A. Each pipe length shall be inspected for cracks, defects in coating or lining, and any other evidences of unsuitability.

- B. Pipe shall be laid in the dry and at no time shall water in the trench be permitted to flow into the pipe.
- C. The pipe shall then be laid on the trench bedding, and the pipe pushed home. Jointing shall be in accordance with the manufacturer's instructions and appropriate ASTM Standards, and the Contractor shall have on hand for each pipe laying crew, the necessary tools, gauges, pipe cutters, etc., necessary to install the pipe in a workmanlike manner. Pipe laying shall proceed upgrade with spigot ends pointing in the direction of the flow.
- D. Blocking under the pipe will not be permitted except where a concrete cradle is proposed, in which case precast concrete blocks shall be used.
- E. After placement of the blanket material, the pipe shall be checked for line and grade and any debris, tools, etc., shall be removed.
- F. If inspection of the pipe indicates that the pipe has been properly installed as determined by the Engineer, the Contractor may then refill or backfill the remainder of the trench in accordance with Section 02160, Backfill and Compaction, and the typical trench detail shown on the Drawings.
- G. At any time that work is not in progress, the end of the pipe shall be suitably closed to prevent the entry of animals, earth, water, etc.
- H. At the end of each day's work or at intervals of length at the option of the Engineer, the Engineer, with the Contractor, will inspect the pipe for alignment with lamps or mirrors. Unsatisfactory work shall be dug up and reinstalled to the satisfaction of the Engineer.

3.5 VALVE INSTALLATION

- A. Install valves of the sizes shown on the Drawings. Valves shall have mechanical joint ends, and shall include all joint accessories and retainer glands. Valves shall be installed plumb and true to line and grade.
- B. Valve boxes shall be installed on all buried valves.

3.6 ENCASEMENT

In the event an underground pipe 10 inches or smaller is shown under a base slab and there is less than 30 inches separation between the top of the pipe and the bottom of the slab, then the pipe shall be encased in concrete for its entire length under the slab in accordance with details shown on the Drawings. Where no detail is shown, encasement shall be formed to provide a minimum of 8 inches of concrete over reinforced with #5 reinforcing bars spaced 12 inches each way. When the top of the pipe is within 12 inches of the bottom of the slab, the encasement shall be tied to the base slab with reinforcing.

3.7 TESTING

General:

Leakage tests under the direction of the Engineer shall be conducted on all pipes installed under this Section. The Engineer shall witness all tests. The Contractor shall supply all plugs, pumps, weirs, gauges, water trucks, etc., necessary to conduct the tests. Should the work fail the leakage tests, corrective action shall be taken by the Contractor in a manner approved by the Engineer and, if directed by the Engineer, the Contractor shall dig up and relay the failed section.

The use of sealants, applied from the inside of the pipe, is not acceptable.

Flush all piping systems with water prior to testing.

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Test all pipe prior to backfilling.

Gravity Pipe testing

Air Test - Leakage testing by means of low pressure air shall be permitted in accordance with the procedures described in UNI-B-6. The air leak rate shall not exceed 0.0015 cfm/square foot at 4 psig.

An in place deflection test will be performed on all PVC sewer pipe. An allowable deflection of 5% internal pipe diameter will be acceptable after all backfilling has been completed. A nine-point "go, No Go" mandrel shall be used for the deflection test and a proving ring shall be provided for each size mandrel. All pipe exceeding the allowable deflection shall be replaced or re-rounded. The Contractor will bear all costs for testing and testing equipment.

Pressure Pipe Testing - All pressure pipe shall be tested as follows:

After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 x the highest working pressure in the section.

Test Pressure Restrictions - Test pressure shall:

Not be less than 50 psi at the highest point along the test section.

Not exceed pipe or thrust restraint design pressures.

Be of at least 2-hour duration.

Not vary by more than ± 5 psi.

Not exceed twice the rated pressure of the valves when the pressure boundary of the test section includes closed gate valves.

Pressurization - Each valved section of pipe shall be filled with water slowly and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe.

Air Removal - Before applying the specified test pressure, air shall be expelled completely from the pipe and valves.

Examination - All exposed pipe, fittings, valves, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, or valves that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated.

Leakage Test

Leakage test shall be conducted concurrently with the pressure test.

Leakage defined: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the water in the pipeline has been expelled and the pipe has been filled with water.

Allowable leakage: No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{ND\sqrt{P}}{7400}$$

L is the allowable leakage, in gallons per hour; N is the number of joints in the length of pipeline tested; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square with gauge.

3.8 PROXIMITY TO WATER MAINS

Whenever possible, sewers shall be laid with a minimum of 10 feet horizontal separation between the sewer and potable water lines. Should a lateral separation of 10 feet not be possible, the following methods of protection must be employed:

Lay sewer and water main in separate trench.

Lay the sewer and water main in same trench with the water main at one side on a bench of undisturbed earth.

In both above cases, the water main invert shall be 18 inches above the sewer crown and there shall be a minimum of 3 + feet of horizontal separation between the pipe outside diameter.

Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least 18 inches below the bottom of the water main. When the elevation of the sewer cannot be varied to meet the above requirements, the water main shall be relocated to provide this separation or reconstruct the sewer line (per water line standards) with mechanical-joint, cement lined ductile iron pipe for a distance of 20 feet on each side of the sewer. One full length of water main should be centered over the sewer so that both joints will be as far from the sewer as possible. The sewer shall not be located above the water main.

When it is impossible to obtain horizontal and/or vertical separation as stipulated above, both the water main and sewer shall be constructed of mechanical-joint cement lined ductile iron pipe or other material based on equivalent water tightness and structural soundness. Both pipes shall be pressure tested at 50 psi for a minimum of 15 minutes with no leakage to assure water tightness.

END OF SECTION

SECTION 461343 – PUMP STATION

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. The Contractor shall furnish and install all components for septic tank effluent pumps as described in the drawings and herein. This will include, but not limited to, piping, pumps, controls, and all ancillary equipment.

2.01 RELATED SECTIONS

- A. Division 01 – GENERAL REQUIREMENTS
- B. Division 22 – PLUMBING
- C. Division 26 – ELECTRICAL

3.01 SUBMITTALS

- A. The Contractor shall comply with the provisions of the Specifications regarding submittals. The following shall be included in submittals as a minimum. However, any additional information or data shall be added if and whenever requested by the Owner or Engineer. Separate data for each pumping unit shall be submitted.
- B. Submittals shall contain descriptive literature as to dimensions and materials of construction. Performance data shall include size of pump, GPM, TDH, BHP, pump efficiency (inlet through discharge head), RPM, performance curves, shutoff head, weight of complete motor/pump as a unit and discharge diameter.

Installation information shall include drawings and information necessary for connecting piping and valves, electrical connections, starting and auxiliary equipment. Submit drawings showing dimensions and scaled assembly outline of the complete pump and all associated equipment. Such drawings shall show plan, elevation and any other views or sections requested. For all pumping units, a scaled cross-sectional drawing of the assembled pump showing full details, parts list of all items and materials of construction shall be submitted for approval.

A scaled drawing of the pump station and valve vault top slabs shall be supplied showing the exact location of all hatches, vents, panel mounting pedestals, hoist sockets and internal wet well piping to be certain that all equipment will properly fit and can be installed and/or removed without undue effort. This drawing shall clearly show location of hinge side of hatch and an exact location of the hoist sockets to ensure that each pump can be pulled in a perfectly vertical fashion. The Contractor shall submit all other drawings, and other information specified, requested, and/or necessary to show complete compliance with all the details of the contract documents.

The pump manufacturer shall submit an Operations and Maintenance Manual containing all information necessary for proper operation and maintenance of pumping units as well as location of the nearest permanent service headquarters. The Operations and Maintenance Manuals shall detail all aspects of the pumps, including dimensions of impeller/wear rings, clearances, model number/size of bearings, size of mechanical seals and related data. There shall be four (4) manuals submitted for each pumping station. These manuals must be submitted when pumps are delivered.

PART 2 - PRODUCTS

2.01 CONTRACT DRAWINGS

The contract drawings are intended to show a general arrangement of pumping equipment, controls, connected piping and valves. The pump manufacturer shall furnish each pumping unit complete with motor and all components necessary for the intended function of the unit and shall be held entirely responsible for the compatibility of all components furnished

2.02 MANUFACTURER

All pumping units shall be an approved design, make and products of manufacturers who have built equipment of similar type, size, and capacity.

The contractor shall submit, upon request, any additional information that the Engineer and/or owner may deem necessary to determine the ability of the proposed manufacturer to produce the specified equipment.

Pumping units shall be products of manufacturers who can produce evidence of their ability to promptly furnish any and all interchangeable replacement parts as may be needed at any time within the expected life of the pumps.

The Contractor shall provide at no cost to the Owner, the services of an accredited representative of the pump manufacturer who shall supervise the installation and testing of each pumping unit and also give operating and maintenance instruction to the Owner's personnel. Pumping equipment shall be tested for performance according to curves and other approved data. Failure of the equipment to perform as curves indicate and with other approved data shall be sufficient cause for rejection.

As one condition necessary to acceptance of any pumping unit, the Contractor shall submit a certificate from the manufacturer, stating that the installation of the pumping unit is satisfactory, that the unit is ready for operation, and that the Owner's operating personnel have been suitably instructed in the operation and maintenance of the unit.

The basis of design for this project is a Zoeller Model 6161. Pumps supplied under this specification shall be as manufactured by Zoeller, Barnes, ABS, Meyers, or equal.

2.03 GENERAL

Contractor shall furnish all labor, material, equipment and incidentals required to provide 2 MODEL 6161 submersible centrifugal effluent / dewatering pump(s) as manufactured by Zoeller or equal with vortex impellers as specified herein.

2.04 OPERATING CONDITIONS

Each submersible pump shall be rated at ½ H.P., 240 volts, 1 phase, 60 HZ., 3450 R.P.M. The unit shall produce 34 G.P.M. at 44 feet of T.D.H.

The submersible pump shall be non-overloading throughout the length of the curve and be capable of operating unsubmerged without damaging the pump. The reserve service factor shall be a minimum of 1.15. The submersible pump shall pass a .75" spherical solid. The submitted performance curve shall show the flow and head capacity of the pump. The pump housing configuration shall have a 2.0" NPT vertical discharge.

2.05 CONSTRUCTION

Each pump shall be of the close coupled U.L. and/or cCSAus listed Model 6161 submersible pump as manufactured by Zoeller Engineered Products of Louisville, Ky. (800-928-7867) or equal. The castings shall be constructed of epoxy coated class 30 cast iron. The motor housing shall be finned and oil-filled to dissipate heat. All external mating parts shall be machined and sealed with a viton square ring. All fasteners exposed to the liquid shall be 300 series stainless steel. The motor shall be protected on the top side with an attached sealed junction box chamber which in the event of cord damage will prevent moisture wicking into the motor housing. The motor shall be protected on the lower side with a tandem mechanical seal arrangement, with each seal having a separate spring assembly. The upper and lower ball bearings shall be capable of handling all thrust loads. The pump housing shall be of the concentric design thereby equalizing the pressure forces inside the housing which will extend the service life of the seals and bearings. The top cap shall have a SS lifting handle. Inlet screens or strainers are prohibited. Pumps shall be equipped with seal leak probes in the seal chamber.

2.06 ELECTRICAL POWER CORD

The pump shall be supplied with a multiconductor power cord. It shall be SO type cord capable of continued exposure to the pumped liquid. Power cord shall be sized for the rated full load amp loading of the pump in accordance with the National Electric Code. Power cable shall enter into

the junction box through a compression type sealing gland. Water sealing and strain relief are separated. The entire junction chamber shall be sealed off from the motor housing by thru wall terminals to protect the motor from moisture.

2.07 MOTOR

The motor shall be an oil filled NEMA B design. At maximum load, the winding temperature will stabilize below the insulation class. Since air-filled motors are not capable of dissipating heat, they shall not be considered equal. Single-phase motors shall include an integral thermal overload switch and the capacitor circuit shall be located in the pump assembly. Three phase motors shall use magnetic starters with overload relays in the control panel for further protection.

2.08 BEARINGS AND SHAFT

The upper and lower ball bearings are continuously lubricated by the oil which fills the motor housing. The motor shaft shall be made of 416 SS and have a minimum diameter of .625".

2.09 SEALS

Pump shall have a dual mechanical seal configuration with the seals mounted in tandem. The lower silicon carbide/carbon and upper carbon/ceramic seals are constructed faces with Buna-n elastomers and a 316 SS spring. It shall be equal to a Crane Type 6a configuration.

2.10 IMPELLER

The impeller shall be of a fully balanced bronze vortex design. It shall be capable of passing a solid sphere of .75". It shall have pump out vanes located on the back shroud to keep debris away from the seal area. Attempts to improve efficiency by coating impeller shall not be acceptable.

2.11 PAINTING

The castings shall be protected with a green powder-coated finish.

2.12 SERVICEABILITY

Components required for the repair of the pump shall be readily available within 24 hours. Components such as mechanical seals and bearings shall not be of a proprietary design and be available from local industrial supply houses. Special tools shall not be required to service the pump. A network of service stations shall be available nationwide in those cases where service requirements are beyond the scope of in-house service mechanics.

2.13 SUPPORT

The pump shall have cast iron support legs enabling it to be a free standing unit. Pump shall be supplied with a guiderail system to facilitate removal. Guide rail system shall be the Z-Rail system as manufactured by Zoeller or equal.

2.14 TESTING:

Each pump shall run in liquid before being shipped. It shall be checked at its maximum running point for performance, amps, grounding, winding insulation, and water tightness.

2.15 CONTROLS

A. GENERAL

Contractor shall furnish all labor, materials, equipment and incidentals required to provide a UL listed pump control panel compatible with the submersible pump(s) specified.

The control panel shall be assembled and tested by a supplier meeting UL Standard 508 for industrial controls. The same manufacturer supplying the submersible pump so as to insure compatibility and assurance in matching the proper panel and features with the pump being supplied shall furnish the control panel and to assure single source responsibility for the equipment supplied.

The panel shall be of a Duplex (2 pump) configuration.

B. CONSTRUCTION

The control panel shall be housed in a NEMA 4X thermoplastic enclosure. Panel shall include a visible and audible high water alarm with dry auxiliary contacts, alarm test and silence switch, IEC rated motor contactor, pump disconnect switch, 3 phase overload protection, control power disconnect switch, selector switches and pilot lights.

The duplex panel configuration shall incorporate a pump alternator function, which enables each pump to operate as the "lead" pump during the alternation sequence. The panel circuitry is to be mounted on a plate, which is bolted to the enclosure with 300 series SS fasteners. The enclosure shall have a hinged front cover with lockable hasp.

The control panel shall provide adjustable overload protection if the pump(s) being controlled does not have an integral thermal overload protection in its motor winding. Single phase controls shall have capacitors and relay mounted in the control panel. The control panel shall include a seal leak monitoring circuit with an external indicator and a thermal cutout circuit, interfaced with the motor contactor and pump's thermal sensor.

Pump run pilot lights and selector switches shall be mounted in the enclosure. The visual high water alarm shall be a top mounted red beacon with 360 degree visual check. The 120 volt control voltage shall be an external dedicated source in single-phase panel. A three-phase panel shall get its 120 volt control power from an internal transformer. A wiring schematic shall be provided and stored in a plastic packet provided in the enclosure. The schematic is to be an exact representation of the panel circuitry identifying the terminal locations for the float switch, pump(s) and incoming power connections.

All ground wires shall be terminated at the grounding lug furnished inside the enclosure. Contractor is responsible for installing the panel so as to maintain the NEMA 4X rating. All conduit, cord connections and enclosure openings are to be properly sealed in a manner, which prevents any liquids or vapors from entering the enclosure. A properly sized and rated main disconnect switch, separate from the panel, is to be installed by the contractor in front of the panel and pump(s), per NEC Code.

C. CONTROL PANEL OPTIONS

1. Flashing high water alarm light.
2. Elapsed time meter. Tracks the number of hours that each pump has operated.
3. Inner door with dead front enclosure, where all pilot lights, selector switches and other monitoring features are mounted.
4. Lightning arrestor. Protects the panel components and pump motor from electrical surges.
5. Anti-Condensation heater. A heater thermostat which protects panel components from condensing moisture by keeping the air temperature above dew point.
6. Alternator selector switch. Enables the operator to manually preset the lead pump or allows the control system to automatically alternate the pumps with each duty cycle.
7. Intrinsically safe relays. Reduce the voltage passing through the float switches to less than 12 volts, which will prevent arcing in case of float damage. Feature is required for a Class 1 Division 1 Group C & D hazardous location.
8. Heavy duty oil tight pilot lights and selector switches.

D. FLOAT SWITCHES AND MOUNTING ACCESSORIES

Provide three (3) UL listed narrow-angle sensor switches with normally open contacts, which close as the float tips slightly above the horizontal plane. Rated at 5 amps, with 2 conductor 16-gauge cable. Float housing to consist of high impact corrosion resistant PVC. The switch shall be suitable for intrinsically safe control circuits.

Float switches shall utilize an external cable weight and be suspended from above with a stainless steel cable bracket. The cable bracket shall be fabricated from 304 SS steel construction with cord grips for four (4) floats.

Provide a watertight junction box suitably sized and constructed to accept and seal all float switch and pump cords located in the basin. A potting kit shall be included and installed, preventing the entry of groundwater through the conduit.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All equipment specified herein and shown on the plans shall be installed by the Contractor in accordance with the instructions of the manufacturer, or as directed by the Engineer.

3.02 SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. The Contractor shall arrange for the manufacturer to furnish the services of a qualified representative as necessary to check and supervise the equipment installation for not less than one (1) day; to supervise the final acceptance test and to supervise the initial operation and to instruct the Owner's operator in operation, proper maintenance, and repairs.
- B. After completion of installation, the equipment shall be inspected and certified by a representative of the manufacturer as being in compliance with the manufacturer's recommendations and requirements. After such inspection, the equipment shall be given any required adjustment and, when complete, the various items of equipment shall be placed into operation under the supervision of the manufacturer's representative. All equipment shall be placed into operation in accordance with a schedule properly coordinated with the Engineer.
- C. Equipment manufacturer shall provide a written report covering his findings and installation approval. The report shall include description of all inspections and any deficiencies noted and shall be mailed directly to the Engineer.
- D. The Contractor guarantees and warrants that during the first year of operation, (date the pump station is tested, placed in service and a written acceptance letter issued by the Owner) the pump station will operate satisfactorily and continuously according to the pump requirements specified herein, and that after due notice has been given by the Owner, he or the pump manufacturer will proceed, within a reasonable time to adjust, regulate, repair and renew at his expense such part or parts, equipment, auxiliaries appurtenances or perform such work as is necessary to maintain the guaranteed capacities efficiencies and performances.
- E. Pump warranty period shall be the standard one-year warranty.

END OF SECTION

SECTION 461353 - MANHOLES

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Precast concrete sections.
- B. Precast concrete tanks.
- C. Brick and mortar.
- D. Frames and covers.
- E. Manhole steps.

1.02 RELATED WORK

- A. Section 312000 - Earthwork.
- B. Section 461313 - Underground Piping
- C. Section 461343 – Pump Station

1.03 STANDARD REFERENCES

- A. ASTM C479-78.
- B. ASTM C443-79.
- C. ASTM C207-76.
- D. ASTM C32-73.

PART 2 - PRODUCTS

2.01 PRECAST CONCRETE SECTIONS

- A. Precast concrete sections and appurtenances shall conform to the ASTM Standard Specifications for Precast Reinforced Concrete Manhole Sections, Designation C479-78, with the following exceptions and additional requirements:
- B. The wall sections shall be not less than 5 in. thick.
- C. Type II cement shall be used except as otherwise permitted.
- D. Joints between sections shall be made with ASTM C990 Joint Sealant.

2.02 STUBS IN MANHOLES

- A. Reinforced-concrete stubs shall be short lengths of reinforced-concrete pipe with bulkheads.
- B. Stubs shall be set accurately to the required line and elevation and shall be installed in the manhole as indicated on the Drawings.

2.03 PREMOLDED ELASTOMERIC-SEALED JOINTS

- A. The CONTRACTOR shall use premolded elastomeric-sealed psx boots for pipe into precast manhole bases as indicated and as specified or equal.
- B. All materials, accessories, and construction methods used in making the joints shall be supplied or approved by the manufacturer of the premolded elastomeric-sealed joint.
- C. The CONTRACTOR shall furnish the manufacturer's written instructions for installation prior to such installation.

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- D. Openings for pipe and penetrations shall be cast in the base or wall of the structure at the required locations during the manufacturing process.

PART 3 - EXECUTION

3.01 INSTALLATION - PRECAST SECTIONS

- A. Sections shall be cured by subjecting them to thoroughly saturated steam at a temperature between 100° and 130°F for a period of not less than 12 hours or, when necessary, for such additional time as may be needed to enable the sections to meet the strength requirements.
- B. No more than two lift holes may be cast or drilled in each section.
- C. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of the barrel.
- D. Acceptance of the sections will be on the basis of material tests and inspection of the completed product.
- E. Cones shall be precast sections of similar construction.
- F. The tops of the bases shall be suitably shaped by means of accurate bell-ring forms to receive the barrel sections.

3.02 SETTING PRECAST MANHOLE SECTIONS

- A. Precast-reinforced concrete manhole sections shall be set so as to be vertical and with sections and steps in true alignment.
- B. All holes in sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose or with mortar. The mortar shall be one part cement to 1-½ parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

3.03 GENERAL MANHOLE INSTALLATION

- A. Excavation for manholes and other underground structures shall be of sufficient size to adequately accommodate installation and proper centering.
- B. As relocation of manholes (from the original stake-out) will change angles between pipe entering and leaving manholes so relocated, the OWNER will not be responsible for manhole invert forms pre-built and non-usable as a result of relocations and subsequent angle change between pipes for any manhole beyond 1,000 feet ahead of the laying operation. Changes in angles of manhole inverts, caused by the relocation of a manhole after the original stakeout, shall be the responsibility of the CONTRACTOR if such relocation is necessitated by conflict with water, gas, or other utility or drain lines.
- C. The part of the concrete base slab under the manhole walls shall be steel trowel finished. Top of slab shall be 3" (or as shown on manhole details) below the lowest sewer invert grade. In sandy soils, an impermeable membrane such as builders felt shall be used under manhole bases to prevent loss of moisture during curing of concrete. The channels through manholes shall be formed by either split tiles, branches and bends, or prefabricated forms of the same size as the sewer barrels connected.
- D. Floors and channels of the manholes shall be constructed of concrete as shown on the Drawings and as specified. The floor of the manholes shall be shaped to provide a slope of at least 2" per foot from manhole sides to main sewer channels and shall be wood float finished to provide a smooth and well drained surface.

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- E. Manhole frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the Drawings or as directed. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.
- F. Manhole covers shall be left in place in the frames on completion of other work at the manholes.

3.04 MANHOLE TESTING

Manholes shall be air tested in accordance with ASTM C1244-93, Standard Test Method for concrete sewer manholes by negative air pressure (vacuum) test.

END OF SECTION

