

HIGHLAND ASSOCIATES

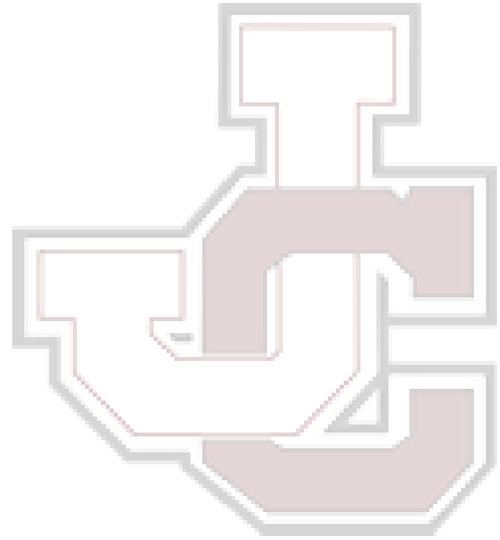
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JOHNSON CITY CENTRAL SCHOOL DISTRICT Johnson City, New York

CAPITAL PROJECT 2025 2026

PHASE 2

HIGH SCHOOL.....	SED # 03-15-02-06-0-011-027
K-8 ELEMENTARY MIDDLE.....	SED # 03-15-02-06-0-020-017
BUS GARAGE.....	SED # 03-15-02-06-5-010-011
BUS STORAGE SOUTH.....	SED # 03-15-02-06-4-014-006
BUS STORAGE NORTH.....	SED # 03-15-02-06-4-015-006

HA PN: 2024-239P

VOLUME 3 ARCHITECTURAL SPECIFICATION

“The design of this project conforms to all applicable provisions of the New York State Uniform Fire Prevention and Building Code, the New York State Energy Conservation Code, and the building standards of the New York State Education Department.”

December 1, 2025

**JOHNSON CITY CENTRAL SCHOOL DISTRICT
CAPITAL PROJECT 2025 & 2026 - PHASE 2
ISSUED FOR BIDDING
DECEMBER 1, 2025**

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HA PN: 2024-239P**

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
 - 3. Salvage of existing items to be reused or recycled.
 - 4. Protection and Non-Disturbance of existing items to remain.
- B. Related Sections include the following:
 - 1. Division 01 Section "Summary of Work" for use of premises, and phasing, and Owner-occupancy requirements.
 - 2. Division 01 Section "Temporary Facilities" for temporary construction and environmental-protection measures for selective demolition operations.
 - 3. Division 01 Section "Execution" for cutting and patching procedures.
 - 4. Division 31 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements.
 - 5. Section 02 41 13 Selective Site Demolition
 - 6. Division 23 for Plumbing Demolition.
 - 7. Division 23 for HVAC Demolition.
 - 8. Division 26 for Electrical Demolition.
 - 9. Division 26 for Handling of Lighting Ballasts and Lamps Containing PCB's and Mercury.
- C. Contractor to provide cutting, patching and demolition shown on the drawings or not shown on the drawings as required for providing areas to install and accept new work. All areas of cutting and patching and of demolition if exposed must receive new finishes.

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 Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner or store for re-installation by the contractor. Noted but not limited to the following items:

1. Existing building signage
2. Dedication plaques
3. Fire extinguishers
4. Trophies/Plaques, etc.

1.5 SUBMITTALS

- A. Qualification Data: For demolition firm.
- 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 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. Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other occupants in adjacent buildings affected by selective demolition operations.
 6. Means of protection for items to remain and items in path of waste removal from building.
- C. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
 1. Comply with submittal requirements in Division 01 Section for Construction Waste Management and Disposal.

1.6 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Professional Engineer Qualifications: Comply with Division 1 Section "Quality Requirements"

- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.
- E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 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.
 - 6. Review occupancy egress and temporary egress for occupants.

1.7 PROJECT CONDITIONS

- A. Owner will occupy buildings immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
 - 1. Comply with requirements specified in Division 01 Section "Contract Summary."
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 1. Before selective demolition, Owner will remove the following items:
 - a. Owner will supply list to contractors with all items that the District will remove and store at another location.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: Hazardous materials are present in construction to be selectively demolished. A report on the presence of hazardous materials may be provided by the Owner. Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is being handled as part of this project.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials.
 - 3. If materials suspected of containing hazardous materials are encountered that are not identified by the University, do not disturb; immediately notify the Construction Manager and Owner. Owner will remove hazardous materials 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. Contractors are responsible for protecting services to remain during demolition and construction work.

1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.
 - 1. If possible, retain original Installer or fabricator to patch the exposed Work listed below that is damaged during selective demolition. If it is impossible to engage original Installer or fabricator, engage another recognized experienced and specialized firm.
 - a. Processed concrete finishes.
 - b. Stonework and stone masonry.
 - c. Ornamental metal.
 - d. Matched-veneer woodwork.
 - e. Preformed metal panels.
 - f. Roofing.
 - g. Firestopping.
 - h. Window wall system.
 - i. Stucco and ornamental plaster.
 - j. Terrazzo.
 - k. Finished wood flooring.
 - l. Fluid-applied flooring
 - m. Aggregate wall coating.
 - n. Wall covering.
 - o. HVAC enclosures, cabinets, or covers.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. Use materials whose installed performance equals, or surpasses that of existing materials.
- B. Comply with material and installations requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- 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. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
 - 1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Contract Summary" and in the Mechanical and Electrical technical specifications.
- B. Service/System Requirements: Each prime contractor is responsible to locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
 - a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall unless existing services/systems are required for the work.

- b. Provide support for any piping, conduit and services that are to remain.

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 Division 01 Section "Temporary Facilities."
- 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 Division 01 Section for "Temporary Facilities."
- 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.
 - 2. Required engineering for shoring, bracing and structural support is by the Contractor.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction, for installation and acceptance of new HVAC, plumbing, fire protection, electrical and technology work 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 Division 01 Section "Construction Waste Management."
10. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations begun.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. 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 reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. 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.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
 - 1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.
- E. Tile Flooring, Ceramic, Quarry etc.: Remove tile flooring and setting bed/material. Prepare substrate for new floor covering for like new installation. Flooring shall not telegraph floor imperfections of any kind.
- F. Wall Tile: Remove tile and setting bed/material. Prepare substrate for new wall finish for like new installation. Wall finish shall not telegraph wall imperfections of any kind.
- G. Wall Covering: Remove wall covering and residual adhesive and material and prepare substrate for new wall finish. Wall finish shall not telegraph wall imperfections of any kind.
- H. Wall Mounted Equipment: Remove wall mounted equipment and residual adhesive, paint build-up and prepare substrate for new wall finish. Wall finish shall not telegraph wall imperfections of any kind.
- I. Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weathertight. Refer to Division 07 Section for new roofing requirements.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing system down to substrate.
- J. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.
- K. Mechanical and Electrical Equipment and Accessory Material: Remove all equipment/material if not required for completed construction.

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 Division 01 Section for "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 02 41 19

SECTION 03 01 30 - RESURFACING OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide all labor, materials, equipment and supervision necessary to install an architectural, decorative, two-component, polymer-modified, cementitious microtopping system over new and/or existing horizontal, interior or exterior concrete slab surfaces, as shown on the project drawings and as outlined in this specification.
- B. Following all applicable manufacturer's guidelines and application instructions shall be considered a requirement of this specification.
- C. Related Sections:
 - 1. Section 03 30 00 – Cast-in-Place Concrete
 - 2. Section 07 92 00 – Joint Sealants

1.2 REFERENCES

- A. ASTM C109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
- B. ASTM C190: Method of Test for Tensile Strength of Hydraulic Cement Mortars..
- C. ASTM C580: Standard Test Method for Flexural and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
- D. ASTM D4263: Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Test Method.
- E. ASTM F1869-04: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Sub-floor Using Anhydrous Calcium Chloride.
- F. ICRI Technical Guideline No.03732: Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data sheets, any applicable installation guidelines or recommendations, and material safety data sheets for each product included in this specification.
- B. Samples: submit manufacturer's standard color charts for review by the specification authority and owner's representative. to exhibit pattern, texture, color and finish of the architectural, decorative, cementitious microtopping system. If a clear coat sealer finish is desired, submitted sample boards shall also include same.

- C. Material certificates signed by the manufacturer certifying that the architectural, decorative, two-component, polymer-modified, cementitious microtopping system complies with all requirements of the material specified herein.
- D. Warranty: Submit a sample of the manufacturer's standard material warranty.
- E. Contractor Project Reference List: Contractor shall submit a minimum of 5 recently completed projects of a similar nature and include total contract value of completed work.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: The manufacturer of the products specified in this section shall have a minimum of 5 years' experience in the production of these types of products and systems.
- B. Contractor Qualifications: The contractor installing the products specified in this section shall have a minimum of 3 years' experience and have successfully completed no less than 5 projects similar in scope and complexity and is acceptable to and has been trained by the manufacturer.
- C. Substitutions: Requests for the approval of any product other than those specified in this section must be submitted to the specifying authority two weeks prior to the bid and shall include complete application specifications and physical characteristics. Any request after this date will not be accepted. Failure of performance requires immediate removal and replacement of unapproved substituted material with those originally specified at no cost to the owner, Architect, construction manager, or general contractor.
- D. Single Source System: All components of the completed microtopping system shall be, without exception, from a single manufacturer for the assurance of a seamless material warranty.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name, batch or lot numbers, and directions for storage and mixing with other components.
- B. Store materials to comply with manufacturer's directions to prevent from damage and/or deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Comply with all the manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required to execute and protect completed work. In hot and cold weather conditions or when high evaporation rates or adverse conditions may be expected, the contractor will be responsible for the quality of the completed installation. When installing cementitious materials, follow all recommendations and guidelines of the American Concrete Institute, as published in ACI Committee 305 for Hot-Weather Concreting and ACI Committee 306 for Cold-Weather Concreting.

- B. Protection: Protect newly installed microtopping system from rain or other potentially harmful climatic conditions for a minimum of 24 hours, from any potential damages due foot or vehicular traffic, and/or from the work of other trades.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Approved Manufacturer: Miracote Division of Crossfield Products Corp., 3000 E. Harcourt Street, Rancho Dominguez, CA 90221, (310) 886-9100; also 140 Valley Road, Roselle Park, NJ 07204, (908) 245-2800, www.miracote.com.

2.2 MATERIALS

- A. Cementitious Microtopping Material: Miracote MPC (Multipurpose Protective Coating) is a pre-packaged, two-component, polymer-modified, cementitious resurfacing system that is applied in a nominal thickness from 1/16” to 3/32” on to properly prepared, new or existing, concrete substrates. One unit of Miracote MPC consists of one (1) five gallon pail of Liquid Catalyst, and two (2) 55# bags of dry powder available in choice of two colors, white and natural cement, and two grades, smooth and regular.
- B. Color Pigmentation: Miracote ColorPax LIP for pigmenting Miracote MPC is available in 15 standard colors (includes capability to match any PMS colors) that are mixed with white powder to match published color charts.

2.3 PROPERTIES

- A. Physical Properties of Cementitious Microtopping Material: Provide a two-component only, polymer-modified, cementitious microtopping system that meets or exceeds the listed minimum physical property requirements when tested in accordance with the referenced standard test method.

Two Component System	Liquid Polymer and Bagged Powder
Compressive Strength (ASTM C 109):	2,440 psi
Tensile Strength (ASTM C 190):	450 psi
Flexural Strength (ASTM C 580)	2,415 psi
Adhesion (MIL-D-3134, Para.4.7.14):	515 psi
Water Absorption (ASTM C 642)	1.61% volume of permeable voids 5.07%
Water Vapor Permeability (ASTM E 96)	1.96 perms/inch
Impact Resistance: (MIL-3134) Para. 4.7.3	No cracking or detachment

(2# steel ball dropped from 8' height onto coated steel plate)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine all concrete or other substrates and conditions where the architectural cementitious microtopping system is to be installed. Notify the Specifying Authority of any unsatisfactory conditions that may be detrimental to the proper and timely completion of the work.
- B. Do not proceed with the work until all such deficiencies have been corrected by the Contractor in an acceptable manner, and as approved by the Specifying Authority.

3.2 PREPARATION

- A. Protect all surrounding areas, walls, window glass, landscaping and other adjacent surfaces from the execution of each item of work including, but not limited to, surface preparation and all application steps of the cementitious microtopping installation.
- B. Perform surface and crack repairs as necessary to re-profile, re-level or to restore the integrity of the concrete substrate in general, as directed by the specifying authority. Concrete surface repair products shall be from the same manufacturer, or as approved by the manufacturer of the concrete microtopping system specified herein. Provide letter from the manufacturer of the surface repair materials verifying compatibility with all the specified architectural resurfacing components.
- C. Architectural cementitious microtopping system must be applied to a clean, sound and mechanically prepared concrete substrate to a minimum CSP-3 surface profile, in accordance with the International Concrete Repair Institutes (ICRI) Technical Guideline 03732, **Selecting and Specifying Concrete surface Preparation for Sealers, Coatings and Polymer Overlays.**
- D. Contractor shall perform tensile bond tests, as directed by the Specification Authority, in accordance with International Concrete Repair Institutes (ICRI) Technical Guideline 03739, **Guide to Using In-Situ Tensile Pull-Off Tests to Evaluate Bond of Concrete Surface Materials.**

3.3 APPLICATION

- A. General: Follow all manufacturers' directions, as published in their product technical data sheets and/or available installation guidelines regarding the application of the decorative cementitious microtopping system, as specified herein.
- B. Substrate Conditioning: Dampen substrate with potable water only. Maintain substrate at saturated surface dry (SSD) condition with no standing water or puddles during the placement of the base coat.
- C. Priming: Not required for the installation. Base coat of the cementitious resurfacing material must be applied over a saturated surface dry (SSD) concrete substrate.

- D. Cementitious Microtopping: Install architectural two-component, polymer-modified, cementitious microtopping system in strict conformance to the most current version of the manufacturer's published installation guidelines and technical instructions. Mix and spread microtopping material onto substrate with magic trowels, hand trowels, squeegees, rollers or other acceptable placement tools in two or more coats depending on traffic, exposure conditions or as specified herein. A wet edge shall be maintained at all times while placing freshly mixed cementitious resurfacing materials. The finished resurfacing installation shall have a uniform thickness of 1/16" to 3/32" for a three coat microtopping system foundation.

3.4 CLEANING

- A. Clean work area and remove/discard all debris resulting from the application of the cementitious microtopping system to the acceptance of the specifying authority or the owner.

3.5 PROTECTION

- A. Protect all completed work of the application during the specified cure time of the material from vehicular or pedestrian traffic, or any exposure to solid or liquid spillage or any other form of contamination.

END OF SECTION 03 01 30

SECTION 03 30 00 - 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.
- B. The drawings and specifications are complimentary. What shall be required by one; shall be as binding as if required by both. If in the event of a conflict, the Contractor shall immediately notify the Engineer who shall provide clarification.

1.2 SUMMARY

- A. Section includes all labor, materials, tools equipment and services, to complete cast-in-place building concrete, including preparing subgrades, subbase, formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing" for furnishing anchor bolts, leveling plates.
 - 2. Section 32 13 01 "Site Concrete Work".

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with: fly ash, slag, silica fume, subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. 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. Construction Manager
 - b. Contractor's superintendent.
 - c. Independent testing agency responsible for concrete design mixtures.
 - d. Ready-mix concrete manufacturer.
 - e. Concrete Subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints and joint filler strips, semi-rigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, concrete repair procedures, and concrete protection.

1.5 SUBMITTALS

- A. Qualification Data: For concrete supplier and testing agency.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 1. Mix identification
 2. Compressive strength specified
 3. Water / Cementitious Ratio
 4. Slump
 5. Air Content
 6. Cement Content Weight
 7. Pozzolan Weight
 8. Aggregate Weight
 9. Water Weight
 10. Admixture Dosage
 11. Fiber Content
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include reinforcing grade, finish bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, lap lengths mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
 1. Mill certificates for reinforcing stating grade and country of origin.
 2. Prepare in accordance with ACI SP-66 Detailing Manual
- D. Product Data:
 1. Cementitious materials
 2. Admixtures
 3. Steel reinforcement and accessories
 4. Fiber reinforcement
 5. Curing compounds
 6. Floor and slab treatments
 7. Bonding agents
 8. Adhesives
 9. Vapor retarders
 10. Semirigid joint filler
 11. Joint-filler strips
 12. Repair materials

13. Water stops
14. Exterior Concrete Treatment
15. Mechanical Couplers

E. Formwork Shop Drawings:

1. For elevated concrete slabs, concrete beams and concrete columns.
2. Prepared by, signed and sealed by a qualified professional engineer registered in the state of the Project who shall be responsible for the preparation, detailing and designing the formwork and shoring per ACI 301 to support vertical, lateral, static, dynamic and construction loads.

F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.6 QUALITY ASSURANCE

- A. Concrete Supplier Qualifications: A firm experienced in manufacturing ready-mixed concrete and that complies with ASTM C 94 requirements for production facilities and equipment.
- B. Testing Agency Qualifications: An independent agency acceptable to authorities having jurisdiction and qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 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.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Concrete Supplier shall engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
 1. Reinforcement shall be stored above grade.
 2. Store formwork above grade and protected from moisture, sunlight, dirt and oil.

1.9 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from premature curing, 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, 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.
 4. Supply adequate heat to grade and newly poured concrete to maintain the surrounding temperature above 50 degrees for a minimum of 7 days.
- B. Hot-Weather Placement: Comply with ACI 301 as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301. Specifications for Structural Concrete.
 2. ACI 117. Specifications for Tolerances for Concrete Construction and Materials.

2.2 FORMWORK

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Metal or other approved panel materials. Plastic mesh materials are prohibited.
- B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 inch minimum.
- C. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

- D. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic (not metal) form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064, plain fabricated from drawn steel wire into flat sheets.
- C. Galvanized-Steel Welded-Wire Reinforcement: ASTM A 185 and A 1064, plain, fabricated from galvanized-steel wire into flat sheets and a Yield Strength of 70,000 PSI.
- D. Low Alloy Steel (Weldable) Reinforcing Bars: ASTM A 706, deformed.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615, Grade 60, smooth plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, standees 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 support contact forms, earth or subbase use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. For galvanized reinforcement, provide galvanized supports.

2.5 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150, Type I, Type III, Gray.
 - 2. Blended Cement: ASTM C595 Type IL
 - 3. Fly Ash: ASTM C 618, Class F.
 - 4. Silica Fume: ASTM C 1240, amorphous silica.
 - 5. Slag: ASTM C989, Grade 100 or 120.

- C. Normal-Weight Aggregates: ASTM C 33 coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 - 3. Classes:
 - a. 1S – Footings
 - b. 2S – Interior Slabs
 - c. 3S – Foundations and Retaining Walls
 - d. 4S – Exterior ramps, pads, slabs, garage slabs
- D. Lightweight Aggregate: ASTM C330, 3/4-inch nominal maximum aggregate size.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494, Type A.
 - 2. Retarding Admixture: ASTM C 494, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.
- G. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C1582, ASTM C 494, Type C. Applied at 2 gallons per cubic yard in concrete mix design.
 - 1. Euclid Chemical Company: Eucom CIA for pool slab, beams, columns and all pool equipment room slabs and walls.
- H. Water: ASTM C 94 and potable.

2.6 FIBER REINFORCEMENT

- A. Synthetic Micro-Fiber: Fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C1116 Type III, 1/2" to 1-1/2" long.
 - 1. Basis of design product: Subject to compliance with requirements, provide 100% virgin polypropylene multifilament fibers Fiberstrand F by Euclid Chemical.

2.7 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured strip, butyl rubber with sodium bentonite for adhesive bonding to concrete.
1. Basis of Design: Waterstop RX by Volclay/CETCO.

2.8 VAPOR RETARDERS

- A. Sheet Vapor Retarder:
1. ASTM E 1745, Class A strength. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 2. Permeance of less than 0.01 Perms per ASTM E1745 Section 7.1.
 3. Basis of Design Product: Steg wrap 15 mil Class A, by Stego Industries.

2.9 HARDENERS

- A. Liquid Hardener: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
1. Basis of Design Product: Subject to compliance with requirements, provide:
 - a. Seal Hard by L&M.
 - b. Euco Diamond Hard by Euclid Chemical.

2.10 EXTERIOR CONCRETE AND REINFORCEMENT TREATMENTS

- A. Sealer shall be silane or siloxane based compound applied at a rate of 125 SF/gallon.
1. Euclid Chemical Company. Euco Guard 100.
 2. L&M Construction Chemicals: Aqualpel Plus.
- B. Coating for exterior reinforcement.
1. Anit-corrosion coating: 3-component, solvent free, epoxy-modified; Armatec 110 EpoCem by SIKA.

2.11 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete. Dissipating product of resins which breakdown upon exposure to UV and traffic for all slabs receiving floor covering. ASTM C309 Type 1.
1. Basis of Design Product: Subject to compliance with requirements, provide:
 - a. Kurez DR VOX by Euclid Chemical Company.
 - b. L&M Cure by L&M Construction Chemicals.

- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Water-borne, membrane forming non-dissipating, curing and sealing compound ASTM C 1315, Type 1, Class A for all exposed concrete slabs.
 - 1. Basis of Design: Super Diamond Clear by Euclid Chemical.
 - 2. L&M Construction Chemicals: L&M Dress & Seal WB

2.12 RELATED MATERIALS

- A. Isolation Joint Filler Strips: ASTM D1751 asphalt – saturated cellulosic fiber or ASTM D1752 cork or self-expanding cork. Not foam plastic.
- B. Isolation and Control Joint Filler: Two-component, semi-rigid, UV-resistant polyurea with a Type D shore durometer hardness range of 34 to 36 according to ASTM D2240.
 - 1. Basis of Design: Qwik Joint UVR by Euclid Chemical
- C. Bonding Agent: ASTM C 1059, Type II, non-re-dispersible, acrylic emulsion or styrene butadiene for bonding freshly mixed concrete to hardened concrete
 - 1. Basis of Design: Weld-Crete by Larson Products Corp.
- D. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors set at 16 inches on-center. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
- E. Subbase: AASHTO #57 under slab-on-grade and equipment pads in minimum thickness noted on drawings.
- F. Slab construction joint dowels: Speed Dowel by Sika.
- G. Slab Construction Joist Keyway: Pro-Key by BoMetals.
- H. Tapered Plate Dowels: Diamond Dowel System by PNA. 1/4" for slabs up to 6"; 3/8" for slabs up to 8".
- I. Warehouse Slab Control Joint Filler: Two-Component, semi-rigid, 100% solids epoxy resin with a Type A shore durometer hardness of A60-70 per ASTM D2240:
 - 1. Basis of Design: Metzger/McGuire MM-60
- J. Drain tile: Heavy-duty dual wall perforated ADS with fibric ASTM F667. Solid wall outside of building footprint. Extend to daylight. Do not connect to any storm lines.
- K. Filter Fabric: Non-woven geotextile of polypropylene fibers – Mirafi 180N

2.13 REPAIR MATERIALS

- A. Underlayment: Cement-based, self-leveling product that can be applied in thicknesses from 1 inch to 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Basis of Design: EucoFloor SL160 by Euclid Chemical.
 2. Primer: Liquid latex bonding agent. Basis of Design: EucoWeld by Euclid Chemical.
 3. Compressive Strength: Not less than 3500 psi at 28 days when tested according to ASTM C 109.
 4. Provide underlayment for all rooms receiving quarry tile, ceramic tile, and all terrazzo.
- B. Repair Overlayment: Cement-based, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

2.14 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.
 2. Submit a standard deviation analysis based on a reliable test records of concrete produced within 6 months of the date of submission for approval using material from the same sources and of the same quantity for use on this project.
- B. Cementitious Materials: Use fly ash, pozzolan, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not more than 20 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 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 and concrete with a w/c ratio below 0.50.
 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.15 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Class A – Footings: Normal-weight concrete.
1. Minimum Compressive Strength: 4000 psi at 28 days.
 2. Maximum W/C Ratio: 0.50.
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: 0 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
- B. Class B – Foundation and Retaining Walls: Normal-weight concrete.
1. Minimum Compressive Strength: 4000 psi at 28 days.
 2. Maximum W/C Ratio: 0.50.
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery.
- C. Class C – Interior Slabs-on-Grade: Normal-weight concrete.
1. Minimum Compressive Strength: 3500 psi at 28 days.
 2. Maximum W/C Ratio: 0.50.
 3. Minimum Cementitious Materials Content: 470 lb/cu. yd.
 4. Slump Limit: 5 inches, plus or minus 1 inch.
 5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
- D. Class J – Exterior : Normal-weight concrete:
1. Minimum Compressive Strength: 4500 psi at 28 days.
 2. Maximum W/C Ratio: 0.45.
 3. Slump Limit: 5 inches, plus or minus 1 inch.
 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery.
 5. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.5 lb/cu. yd.
- E. Class D – Supported Slabs: Light weight concrete:
1. Minimum Comprehensive Strength: 3500 psi at 28 days.
 2. Minimum Cementitious Content: 470 lb./cu. yd.
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
 5. Unit Weight: 115 lb/cf per ASTM C567
- F. Class I: Class I: Normal-weight concrete used for interior metal pan stairs and landings:
1. Exposure Class: ACI 318; Class F0.
 2. Minimum Compressive Strength: 3000 psi at 28 days.
 3. Maximum w/cm Ratio: 0.53.
 4. Minimum Cementitious Materials Content: 470 lb/cu.yd.
 5. Maximum Size Aggregate: 1/2 inch.
 6. Slump Limit: 3 inches, plus 1 inch or minus 2 inches.
 7. Air Content: 0 percent, plus or minus 1.5 percent at point of delivery.

8. Synthetic Microfiber: Uniformly disperse, per manufacturer's recommended rate.
9. Retarding Admixture: Not allowed.
10. Accelerating Admixture: Not allowed.

G. Class G: Normal weight concrete for building concrete framing members (beams, columns, supported slabs not on deck)

1. Minimum Compressive Strength: 5000 psi at 28 days.
2. Maximum w/cm Ratio: 0.40.
3. Slump Limit: 5 inches, plus or minus 1 inch.
4. Minimum Cement Content: 520 lbs/cu.yd.
5. Air Content: Do not allow air content to exceed 3 percent.

2.16 FABRICATING REINFORCEMENT

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

2.17 CONCRETE MIXING

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

1. When air temperature is between 85 and 90 deg. F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg. F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

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. Fully comply with all OSHA requirements.

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 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct 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 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 opening, chases, offsets, sinkage's, 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 ITEM INSTALLATION

- 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 303.
 2. Aluminum items shall not be embedded in concrete
 3. Install dovetail anchor slots in concrete structures as indicated at 16" o.c. with protective covering
 4. Electrical conduits shall not be embedded in slabs or pads on grade. Top of conduits shall be a minimum of 2" below bottom of slab.
 5. Embedded items are prohibited in grade beams, footings supported slabs, elevated beams, piers and columns.
 6. Form reglets of galvanized sheet steel, 24 gauge minimum with protective covering.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg. F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for piers, beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength, as proven by test cylinders.
 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, are not 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 Engineer.

3.4 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
1. Lap joints 6 inches and seal at all laps, walls, etc., with manufacturers recommended tape.
 2. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 3. Face laps away from exposed direction of concrete pour.
 4. Extend vapor barrier 4" up vertical surfaces.
 5. Make repairs to vapor barrier prior to concrete placement, including construction joint form stakes.

3.6 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars. Support reinforcing bars at 48 inches on-center and welded wire fabric at 36 inches on-center.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced 36" on-center. Lap edges and ends of adjoining sheets at least one mesh spacing plus 2 inches. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780. Use galvanized-steel wire ties to fasten zinc-coated steel reinforcement. Repair cut and damaged galvanizing with zinc material per ASTM A708
- G. Lap all tension reinforcement per ACI standards but not less than 50 bar diameters and all compression and temperature reinforcement 24 bar diameters. Pier dowels and verticals shall be considered tension members.
- H. Apply anticorrosion inhibitor to exterior reinforcement.

3.7 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 Engineer.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists and girders in the middle third of spans.
 - 4. Locate horizontal joints in walls and columns only 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 in elevation but not more than 20 ft. on-center. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible. Space joints symmetrically between piers.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 7. 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.
- C. Control Joints in exterior pad and Slabs-on-Grade: Form weakened-plane contraction joints, section concrete into areas as indicated on drawings but not more than 2x slab thickness in each direction. Construct contraction joints for a depth equal to at least one-third of concrete thickness as follows: (but not less than 1-1/2")

1. Sidewalks: Grooved Joints in exterior concrete: Form contraction joints after initial floating by grooving (tooling) and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Slab-on-Grade Sawcut Joints: Form construction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8" wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks but WITHIN 2 HOURS OF PLACEMENT (overtime work shall be considered incidental).
- D. Isolation Joints in Slabs: Install joint filler material at vertical surfaces including penetrations. Top of strip shall be 1/2 inch below top of slab.

3.8 CONCRETE PLACEMENT

- A. No concrete shall be placed until all shop drawings are approved and the soil, reinforcing, forms have been inspected and approved.
- B. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required Municipal and special inspections are completed.
- C. Do not add water to concrete during delivery or at Project site, or during placement unless approved by Engineer.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is 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 not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- 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.

6. Do not place concrete floors and slabs in checkerboard sequence.

3.9 FINISHING FORMED SURFACES

- A. Smooth-Formed Finish SF-3.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair voids and patch tie holes larger than 3/4" wide or deeper than 1/2". Remove fins and other projections that exceed 1/8". Surface tolerances shall comply with ACI 117 Class A.
 1. Apply to all concrete surfaces exposed to view.
- B. 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, SLABS AND EQUIPMENT PADS

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten 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. **DO NOT ADD WATER TO CONCRETE SURFACE.**
 1. Finish and measure surface in accordance with ASTM E1155, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
- C. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, walks, 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 ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. 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:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Unless detailed otherwise on drawings, construct concrete bases 4-inch interior, 18 inch exterior high unless otherwise indicated, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 3. Minimum Compressive Strength: 3500 psi interior, 4500 psi exterior, at 28 days.
 4. Install #3 dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchors. Thicken slab as required by manufacturer. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported 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 CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h calculated in accordance with ACI 305R 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 remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.

- b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - d. Moisture cure when required by Shake-on Hardener Manufacturer.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
- a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
3. Slabs Receiving 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. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies in writing, curing compound does not interfere with bonding of floor covering used on Project.
4. Slabs Receiving 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.
5. Provide 28 days of curing with absorptive cover when required by floor finish.

3.13 LIQUID FLOOR TREATMENT APPLICATION

- A. Hardener: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 2. Do not apply to concrete that is less than 28 days' old.
 - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
 - 4. Apply hardener to loading docks, storage rooms and warehouse floors.

- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.
- C. Exterior Concrete Treatment
 - 1. All surface preparation shall be incidental and in accordance with manufacturer's instructions.
 - 2. Apply anti-spalling compound to all exterior concrete pads, walks, curbs, ramps, etc. Apply second coat immediately after first coat.

3.14 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 six months. 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 joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer and the Owner. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/4 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, 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 matches 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 Engineer.

4. Grind any non-flush surfaces to the satisfaction of the 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 1/32 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by application of self-leveling compound. 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 or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.16 FIELD QUALITY CONTROL

- A. Special Inspections and Testing: Owner shall engage a special inspector and qualified testing agency acceptable to the Municipality and Engineer, to perform field tests and inspections and prepare test reports.
- B. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31.

- C. Testing agency to immediately report to Engineer, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
- D. Testing agency to report results of tests and inspections, in writing, to Owner, Engineer, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports to include reporting requirements of ASTM C31, ASTM C39, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results of fresh concrete, including slump, air content, temperature and density.
 - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- E. Inspections:
 - 1. Steel reinforcement placement and support.
 - 2. Anchor bolts, Headed bolts and studs.
 - 3. Verification of use of required design mixture.
 - 4. Concrete placement, including conveying and depositing.
 - 5. Curing procedures and maintenance of curing temperature.
 - 6. Verification of concrete strength before removal of shores and forms from beams and slabs.
 - 7. Soil Bearing capacity.
 - 8. Backfill Compaction
 - 9. Subbase depth
 - 10. Refer to Drawings for any additional testing/inspections.
- F. 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 for each 25 cu. yd. or fraction thereof.
 - a. Samples shall be prepared by Testing Agency NOT CONTRACTOR. Cylinders shall be stored in a curing box at the job site and heated with a 100W light bulb if slab is heated.

- b. When frequency of testing provides 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; 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; one test hourly when air temperature is 40 deg. F and below or 80 deg. F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 138, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31.
 - a. Cast and field cure two sets of two standard 6 inch X 12 inch or three sets of 4 inch X 8 inch cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39; test one set of two laboratory-cured specimens at 7 days and two sets of two specimens at 28 days, and two sets of two specimens at 56 days if required when compressive strength does not attain at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. 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.
10. Test results shall be reported in writing to Engineer, 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.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
12. 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 Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Engineer.

13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents. Work shall be considered defective if it does not pass tests and inspections.

G. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

H. Refer to drawings for additional requirements.

3.17 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

B. Provide protection until acceptance by Owner.

END OF SECTION 03 30 00

SECTION 03 54 16 - HYDRAULIC CEMENT UNDERLAYMENT

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 hydraulic-cement-based underlayment for use below interior floor coverings.
- B. Related Sections include the following:
 - 1. Division 09 Sections for patching and leveling compounds applied with floor coverings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.
- C. Manufacturer Certificates: Signed by manufacturers of both underlayment and floor covering system certifying that products are compatible.
- D. Qualification Data: For Installer.
- E. Minutes of pre-installation conference.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.
- B. Product Compatibility: Manufacturers of both underlayment and floor covering system certify in writing that products are compatible.
- C. Mockups: Apply hydraulic-cement-based underlayment mockups to demonstrate surface finish, bonding, texture, tolerances, and standard of workmanship.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature and humidity, ventilation, and other conditions affecting underlayment performance.
 - 1. Place hydraulic-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

1.7 COORDINATION

- A. Coordinate application of underlayment with requirements of floor covering products, including adhesives, specified in Division 09 Sections, to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 HYDRAULIC-CEMENT-BASED UNDERLAYMENTS

- A. Underlayment: Hydraulic-cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thicknesses of 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Products: Subject to compliance with requirements, provide one of the following or recommended by finish flooring manufacturer:
 - a. Ardex; K-15 Self-Leveling Underlayment Concrete or approved equal.
 - b. A-81 Under Layment – Dex-O-TEX.
 - 2. Cement Binder: ASTM C 150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
 - 3. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
 - 4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer formulated for use with underlayment when applied to substrate and conditions indicated.
- B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch; or coarse sand as recommended by underlayment manufacturer.

1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.
- C. Water: Potable and at a temperature of not more than 70 deg F.
- D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated. Primer for standard absorbent concrete shall be ARDEX P-51 Primer.

2.2 MIX DESIGNS

- A. Standard Mixing Ratio: ARDEX K15 is mixed in 2-bag batches at one time. Mix each bag of ARDEX K-15 (55 lb.) with 7 quarts of water. Product shall be mixed in an ARDEX T-10 Mixing Drum using an ARDEX- T-1 Mixing Paddle and a ½” heavy-duty drill (min. 650 rpm). Mix thoroughly for approximately 2-3 minutes to obtain a lump-free mixture. Follow written instructions per the ARDEX K-15 bag label.
- B. Aggregate mix: For areas to be installed over 1-1/2” thick, aggregate may be added to reduce material costs. Mix ARDEX K-15 with water first, then add from 1/3 up to 1 part by volume of aggregate (1/8” to ¼” or larger). Do not use sand.
- C. For pump installations. ARDEX K-15 shall be mixed using the ARDEX Levelcraft Automatic Mixing Pump. Start the pump at 210 gallons of water per hour, and then adjust to the minimum water reading that still allows self-leveling properties. DO NO OVERWATER! Check the consistency of the product on the floor to ensure a uniform distribution of the sand aggregate at both the top surface and bottom of the pour. If settling is occurring, reduce the water amount and recheck. Conditions during the installation, such as variations in water, powder, substrate and ambient temperature, require that the water setting be monitored and adjusted carefully to avoid overwatering.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance.
 1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
 1. Treat and repair nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
 2. Fill substrate voids to prevent underlayment from leaking.

- B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
 - 1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - 2. All concrete subfloors must be of adequate strength. Mechanically clean if necessary, using shot blasting. Acid etching and the use of sweeping compounds and solvents are not acceptable.
- C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
 - 1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
 - 2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
 - 3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
 - 1. Primer for standard absorbent concrete subfloors: Mix ARDEX P051 1:1 with water and apply evenly with a soft push broom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, thin film (min. 3 hours, max 24 hours). Underlayment shall not be applied until the primer is dry. Primer coverage is approximately 400 to 600 sq. ft. per gallon.
 - 2. Primer for extremely absorbent concrete subfloors: Make an initial application of ARDEX P-51 mixed with 3 parts water using a soft push broom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry thoroughly before proceeding with the standard application of primer as described above for standard absorbent concrete.
- C. Apply underlayment to produce uniform, level surface.
 - 1. Apply a final layer without aggregate to produce surface.
 - 2. Feather edges to match adjacent floor elevations.
- D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

- E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
- F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 PROTECTION

- A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 03 54 16

SECTION 04 01 20 - MAINTENANCE OF 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 maintenance of unit masonry consisting of brick clay masonry restoration and cleaning as follows:
 - 1. Repairing unit masonry, including replacing units.
 - 2. Reanchoring veneers.
 - 3. Repointing joints.
 - 4. Preliminary cleaning, including removing plant growth.
 - 5. Cleaning exposed unit masonry surfaces.
- B. Related Sections:
 - 1. Section 04 53 00 "Cast Stone Restoration."

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 01 22 00 "Unit Prices."
 - 1. Unit prices apply to authorized work covered by estimated quantities.

1.4 DEFINITIONS

- A. Very Low-Pressure Spray: Under 100 psi.
- B. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.
- C. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.
- D. High-Pressure Spray: 800 to 1200 psi; 4 to 6 gpm.
- E. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on masonry units as follows.
1. Provide test specimens as indicated and representative of proposed materials and construction.
 2. Existing Mortar: Test according to ASTM C 295, modified as agreed by testing service and Architect for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength. Use X-ray diffraction, infrared spectroscopy, and differential thermal analysis as necessary to supplement microscopical methods. Carefully remove existing mortar from within joints at five locations designated by Architect.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.
- B. Samples for Initial Selection: For the following:
1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.
 - a. Have each set contain a close color range of at least three Samples of different mixes of colored sands and cements that produce a mortar matching the cleaned masonry when cured and dry.
 - b. Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.
 2. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry representative of the range of masonry colors on the building.
 - a. Have each set contain a close color range of at least three Samples of different mixes of patching compound that matches the variations in existing masonry when cured and dry.
 3. Sealant Materials: See Section 07 92 00 "Joint Sealants."
 4. Include similar Samples of accessories involving color selection.
- C. Samples for Verification: For the following:
1. Each type of masonry unit to be used for replacing existing units. Include sets of Samples as necessary to show the full range of shape, color, and texture to be expected.
 - a. For each brick type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.

2. Each type of sand used for pointing mortar; minimum 1 lb of each in plastic screw-top jars.
 - a. For blended sands, provide Samples of each component and blend.
 - b. Identify sources, both supplier and quarry, of each type of sand.
3. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.
 - a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.
4. Each type of masonry patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.
5. Sealant Materials: See Section 07 92 00 "Joint Sealants."
6. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For restoration specialists, including field supervisors and restoration workers, chemical-cleaner manufacturer and testing service.
- B. Preconstruction Test Reports: For existing mortar.
- C. Quality-Control Program.
- D. Restoration Program.
- E. Cleaning Program.

1.8 QUALITY ASSURANCE

- A. Restoration Specialist Qualifications: Engage an experienced masonry restoration and cleaning firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience installing standard unit masonry is not sufficient experience for masonry restoration work.
 1. At Contractor's option, work may be divided between two specialist firms: one for cleaning work and one for repair work.
 2. Field Supervision: Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning work is in progress. Supervisors shall not be changed during Project except for causes beyond the control of restoration specialist firm.
 3. Restoration Worker Qualifications: Persons who are experienced and specialize in restoration work of types they will be performing.

- B. 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-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.
- C. Source Limitations: Obtain each type of material for masonry restoration (face brick, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.
- D. Restoration Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration work including protection of surrounding materials and Project site.
 - 1. Include methods for keeping pointing mortar damp during curing period.
 - 2. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.
- E. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used, protection of surrounding materials, and control of runoff during operations.
 - 1. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.
- F. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 50 feet away by Architect. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.
- G. Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.
 - 1. Masonry Repair: Prepare sample areas for each type of masonry material indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than 2 adjacent whole units or approximately 48 inches in least dimension. Erect sample areas in existing walls unless otherwise indicated, to demonstrate quality of materials, workmanship, and blending with existing work.
 - 2. Repointing: Rake out joints in 2 separate areas, each approximately 36 inches high by 48 inches wide for each type of repointing required and repoint one of the areas.
 - 3. Cleaning: Clean an area approximately 25 sq. ft. for each type of masonry and surface condition.
 - a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not use cleaners and methods known to have deleterious effect.

- b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.
 - 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- H. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to masonry restoration and cleaning including, but not limited to, the following:
 - a. Construction schedule. Verify availability of materials, Restoration Specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- 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 hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- D. Store lime putty covered with water in sealed containers.
- E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.10 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.
- B. Repair masonry units and repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated.
- C. Cold-Weather Requirements: Comply with the following procedures for masonry repair and mortar-joint pointing unless otherwise indicated:
 - 1. When air temperature is below 40 deg F, heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F.

2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 7 days after repair and pointing.
- D. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.
- E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.
- F. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.11 COORDINATION

- A. Coordinate masonry restoration and cleaning with public circulation patterns at Project site. Some work is near public circulation patterns. Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.12 SEQUENCING AND SCHEDULING

- A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.
- B. Order sand and portland cement for pointing mortar immediately after approval of mockups. Take delivery of and store at Project site a sufficient quantity to complete Project.
- C. Perform masonry restoration work in the following sequence:
 1. Remove plant growth.
 2. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 3. Remove paint.
 4. Clean masonry surfaces.
 5. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
 6. Repair masonry, including replacing existing masonry with new masonry materials.
 7. Rake out mortar from joints to be repointed.
 8. Point mortar and sealant joints.
 9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
 10. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 11. Remove paint.
 12. Clean masonry surfaces.

- D. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units to comply with "Masonry Unit Patching" Article. Patch holes in mortar joints to comply with "Repointing Masonry" Article.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

- A. Face Brick: Provide face brick, (to match existing) where required to complete masonry restoration work.
 - 1. Provide units with colors, color variation within units, surface texture, size, and shape to match existing brickwork and with physical properties.
 - a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II, white or gray where required for color matching of exposed mortar.
 - 1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, (Type N Mortar).
- C. Factory-Prepared Lime Putty: ASTM C 1489.
- D. Quicklime: ASTM C 5, pulverized lime.
- E. Mortar Sand: ASTM C 144 unless otherwise indicated.
 - 1. Color: Provide natural sand of color necessary to produce required mortar color.
 - 2. For pointing mortar, provide sand with rounded edges.
 - 3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
- F. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.
- G. Water: Potable.

2.3 MANUFACTURED REPAIR MATERIALS

- A. Masonry Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching masonry.

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. Cathedral Stone Products, Inc.; Jahn M100 Terra Cotta and Brick Repair Mortar.
 - b. Conproco Corporation; Mimic.
 - c. Edison Coatings, Inc.; Custom System 45.
2. Use formulation that is vapor- and water permeable (equal to or more than the masonry unit), exhibits low shrinkage, has lower modulus of elasticity than the masonry units being repaired, and develops high bond strength to all types of masonry.
3. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
4. Formulate patching compound used for patching brick in colors and textures to match each masonry unit being patched. Provide sufficient number of not less than three colors to enable matching the color, texture, and variation of each unit.

2.4 CLEANING MATERIALS

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of 140 to 160 deg F.
- C. Nonacidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dumond Chemicals, Inc.; Safe n' Easy Architectural Cleaner/Restorer.
 - b. PROSOCO; Enviro Klean 2010 All Surface Cleaner.

2.5 ACCESSORY MATERIALS

- A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.
 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. ABR Products, Inc.; Rubber Mask.
 - b. Price Research, Ltd.; Price Mask.
 - c. PROSOCO; Sure Klean Strippable Masking.

B. Sealant Materials:

1. Provide manufacturer's standard chemically curing, elastomeric sealant(s) of base polymer and characteristics indicated below that comply with applicable requirements in Section 07 92 00 "Joint Sealants."
 - a. Single-component, nonsag urethane sealant.
2. Colors: Provide colors of exposed sealants to match colors of masonry adjoining installed sealant unless otherwise indicated.

C. Joint-Sealant Backing:

1. 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.
2. 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 where such adhesion would result in sealant failure. Provide self-adhesive tape where acceptable.

D. Masking Tape: Nonstaining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely including adhesive.

E. Miscellaneous Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Little possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:
 - a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
 - b. Leave a residue on surfaces.

2.6 MORTAR MIXES (TYPE N MORTAR)

A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C 5 and manufacturer's written instructions.

B. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this

dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.

- C. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.
 - 1. Mortar Pigments: Where mortar pigments are indicated, do not exceed a pigment-to-cement ratio of 1:10 by weight.
- D. Do not use admixtures in mortar unless otherwise indicated.
- E. Mortar Proportions: Mix mortar materials in the following proportions:
 - 1. Pointing Mortar for Brick: Type N mortar.
 - a. Add mortar pigments to produce mortar colors required.
 - 2. Rebuilding (Setting) Mortar: Same as pointing mortar except mortar pigments are not required.
 - 3. Rebuilding (Setting) Mortar: Comply with ASTM C 270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime.

2.7 CHEMICAL CLEANING SOLUTIONS

- A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical-cleaner manufacturer.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.
 - 1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.
- B. Comply with chemical-cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent 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 chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or

- porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
2. Keep wall wet below area being cleaned to prevent streaking from runoff.
 3. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
 4. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
 5. Dispose of runoff from cleaning 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.
- C. Prevent mortar from staining face of surrounding masonry and other surfaces.
1. Cover sills, ledges, and projections to protect from mortar droppings.
 2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
 3. Immediately remove mortar in contact with exposed masonry and other surfaces.
 4. Clean mortar splatters from scaffolding at end of each day.

3.2 BRICK REMOVAL AND REPLACEMENT

- A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
1. When removing single bricks, remove material from center of brick and work toward outside edges.
- B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
- D. Remove in an undamaged condition as many whole bricks as possible.
1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
 2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
 3. Store brick for reuse. Store off ground, on skids, and protected from weather.
 4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.
- E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.
- F. Replace removed damaged brick with other removed brick and salvaged brick in good quality, where possible, or with new brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.
- G. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

1. Maintain joint width for replacement units to match existing joints.
 2. Use setting buttons or shims to set units accurately spaced with uniform joints.
- H. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.
1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
 2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as repointing of surrounding area.
 3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.3 CLEANING MASONRY, GENERAL

- A. Clean all stained brick areas.
- B. Use only those cleaning methods indicated for each masonry material and location.
1. Do not use, wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
 2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
 - a. Equip units with pressure gages.
 3. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
 4. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
 5. For high-pressure water-spray application, use fan-shaped spray tip that disperses water at an angle of at least 40 degrees.
 6. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
- C. 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.
- D. Water Application Methods:
1. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

- E. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with 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 by manufacturer.
- F. 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.
- G. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.4 PRELIMINARY CLEANING

- A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.
- B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.
 - 1. Carefully remove heavy accumulations of material from surface of masonry with a 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 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.

3.5 CLEANING BRICKWORK

- A. Cold-Water Wash: Use cold water applied by low-pressure spray.
- B. Hot-Water Wash: Use hot water applied by low-pressure spray.
- C. Mold, Mildew, and Algae Removal:
 - 1. Wet masonry with hot water applied by low-pressure spray.
 - 2. Apply mold, mildew, and algae remover by brush or low-pressure spray.

3. Scrub masonry 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 masonry surface remains wet.
4. Rinse with hot water applied by low-pressure spray to remove mold, mildew, and algae remover and soil.
5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

D. Nonacidic Liquid Chemical Cleaning:

1. Wet masonry with hot water applied by low-pressure spray.
2. Apply cleaner to masonry in two applications by brush or low-pressure spray. Let cleaner remain on surface for period indicated below:
 - a. As recommended by chemical-cleaner manufacturer.
 - b. As established by mockup.
 - c. Two to three minutes.
3. Rinse with hot water applied by low-pressure spray to remove chemicals and soil.
4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.

3.6 REPOINTING MASONRY

A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.
2. Joints where mortar is missing or where they contain holes.
3. Cracked joints where cracks can be penetrated at least 1/4 inch by a knife blade 0.027 inch thick.
4. Cracked joints where cracks are 1/8 inch or more in width and of any depth.
5. Joints where they sound hollow when tapped by metal object.
6. Joints where they are worn back 1/4 inch or more from surface.
7. Joints where they are deteriorated to point that mortar can be easily removed by hand, without tools.
8. Joints where they have been filled with substances other than mortar.
9. Joints indicated as sealant-filled joints.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, according to procedures demonstrated in approved mockup:

1. Remove mortar from joints to depth 2 times joint width, but not less than 1/2 inch or not less than that required to expose sound, unweathered mortar.
2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.

3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.
 - a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Architect's written approval based on approved quality-control program.
 - b. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and resilient mallet. Strictly adhere to approved quality-control program.

- D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

- E. Pointing with Mortar:
 1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
 2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
 3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.
 4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
 5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours including weekends and holidays.
 - a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
 - b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
 6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

- F. Pointing with Sealant: (where indicated)
 1. After raking out, keep joints dry and free of mortar and debris.

2. Clean and prepare joint surfaces according to Section 07 92 00 "Joint Sealants." Prime joint surfaces unless sealant manufacturer recommends against priming. Do not allow primer to spill or migrate onto adjoining surfaces.
3. Fill sealant joints with specified joint sealant according to Section 07 92 00 "Joint Sealants" and the following:
 - a. Install cylindrical sealant backing beneath the sealant, except where space is insufficient. There, install bond-breaker tape.
 - b. Install sealant using only proven installation techniques that will ensure that sealant will be deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding masonry and matching the contour of adjoining mortar joints.
 - c. Install sealant as recommended by sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead:
 - 1) Fill joints to a depth equal to joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.
 - d. Immediately after first tooling, apply ground-mortar aggregate to sealant, gently pushing aggregate into the surface of sealant. Retool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant and aggregate from surfaces adjacent to joint.
 - e. Do not allow sealant to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces, particularly rough textures. Remove excess and spillage of sealant promptly as the work progresses. Clean adjoining surfaces by the means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mockup.
4. Cure sealant according to Section 07 92 00 "Joint Sealants."

- G. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.7 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.
 1. Do not use metal scrapers or brushes.
 2. Do not use acidic or alkaline cleaners.
- B. Wash adjacent woodwork and other nonmasonry surfaces. Use detergent and soft brushes or cloths.

- C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
- D. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

3.8 FIELD QUALITY CONTROL

- A. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.
- B. Notify Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Architect's Project representatives have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

END OF SECTION 04 01 20

SECTION 04 05 13.91 - VERTICAL REPAIR MORTAR

GENERAL

1.1 SUMMARY

A. Section Includes:

Application of non-sag concrete repair mortar with integral corrosion inhibitor for vertical and overhead applications.

B. Related Sections:

Section 03 30 00 – Cast-In-Place Concrete.

1.2 SUBMITTALS

A. Comply with Section [01 33 00] [__ __ __].

B. Product Data: Submit manufacturer's technical data sheets and LEED product information for each product.

C. Quality Control Submittals:

1. Provide protection plan of surrounding areas and non-cementitious surfaces.

1.3 QUALITY ASSURANCE

A. Comply with Section [01 40 00] [__ __ __].

B. Qualifications:

Manufacturer Qualifications: Company with minimum 15 years of experience in manufacturing of specified products.

Manufacturer Qualifications: Company shall be ISO 9001:2000 Certified.

Applicator Qualifications: Company with minimum of 5 years' experience in application of specified products on projects of similar size and scope, and is acceptable to product manufacturer.

a. Successful completion of a minimum of 5 projects of similar size and complexity to specified Work.

C. Field Sample:

Install at Project site or pre-selected area of building an area for field sample, minimum 2 feet by 2 feet (1.2 m by 1.2 m), using specified material.

Apply material in accordance with manufacturer's written application instructions.

Manufacturer's representative or designated representative will review technical aspects;
surface preparation, repair, and workmanship.

Field sample will be standard for judging workmanship on remainder of Project.

Maintain field sample during construction for workmanship comparison.

Do not alter, move, or destroy field sample until Work is completed and approved by Architect.

Obtain Architect's written approval of field sample before start of material application,
including approval of aesthetics, color, texture, and appearance.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section [01 60 00] [__ __ __].
- B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- C. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.
- E. Precondition materials to 70 degrees F plus or minus 5 degrees F (21 degrees C plus or minus 3 degrees C) before mixing.

1.5 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Do not use products under conditions of precipitation or freezing weather. Do not apply material at temperatures below 40 degrees F (4 degrees C) or above 90 degrees F (32 degrees C). Use appropriate measures for protection and supplementary heating to ensure proper curing conditions per manufacturer's recommendations if application during inclement weather occurs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products from the following manufacturer:

Sika Corporation (Basis of Design)
201 Polito Avenue
Lyndhurst, NJ 07071
201-933-8800

- B. Substitutions: Comply with Section [01 60 00] [__ __ __].

- C. Specifications and Drawings are based on manufacturer's proprietary literature from Sika Corporation. Other manufacturers shall comply with minimum levels of material and detailing indicated in Specifications or on Drawings. Architect will be sole judge of appropriateness of substitutions.

2.2 MATERIALS

- A. Nonsag, lightweight, 1-component, high-strength, polymer-modified, silica-fume-enhanced repair mortar with integral corrosion inhibitor for vertical and overhead applications.

Manufactured to be placed from 1/4 inch (6 mm) to 2 inches (51 mm) per lift.
 Acceptable Product (Basis of Design): SikaEmaco 425 Gel Patch(formerly M-425).

- B. Properties of mixed cementitious repair materials:

Working Time, 70 degrees F (21 degrees C): 20 to 30 minutes.
 Color: Concrete gray

- C. Properties of cured cementitious repair materials:

1. Compressive Strength, ASTM C109, Modified:

- a. 1 Day: 2,150 psi (14.8 MPa).
- b. 7 Days: 5,600 psi (38.6 MPa).
- c. 28 Days: 6,750 psi (46.5 MPa).

Splitting Tensile Strength, ASTM C496, Modified, wet cure:

- d. 1 Day: 310 psi (2.1 MPa).
- e. 7 Days: 560 psi (3.9 MPa).
- f. 28 Days: 610 psi (4.2 MPa).

Flexural Strength, ASTM C348, Modified:

- g. 1 Day: 500 psi (3.4 MPa).
- h. 7 Days: 800 psi (5.5 MPa).
- i. 28 Days: 1,110 psi (7.7 MPa).

Bond Strength, ASTM C882, Modified, mortar scrubbed into substrate:

- j. 1 Day: 900 psi (6.2 MPa).
- k. 7 Days: 1,900 psi (13.1 MPa).
- l. 28 Days: 2,450 psi (16.9 MPa).

Chloride Permeability, AASHTO T277, ASTM C1202 Table 1:

- m. Very low range.

Length Change, ASTM C157, wet cure:

- n. 1 Day: Plus 0.019 percent, in/in.

- o. 7 Days: Plus 0.028 percent, in/in.
- p. 28 Days: Plus 0.034 percent, in/in.

Length Change, ASTM C157, dry cure at 50 percent relative humidity:

- q. 1 Day: Minus 0.026 percent, in/in.
- r. 7 Days: Minus 0.11 percent, in/in.
- s. 28 Days: Minus 0.15 percent, in/in.

Modulus of Elasticity, ASTM C215:

- t. 5.6×10^5 psi (3,861 MPa).

Linear Coefficient of Thermal Expansion, ASTM C531:

- u. 5.3×10^{-6} in/in/degree F.

Water Absorption, ASTM C642:

- v. 28 Days: 4 percent.

VOC Content:

- w. 0 lbs per gal (0 g/L), less water and exempt solvents.

PRODUCTS

2.3 EXAMINATION

- A. Comply with Section [01 70 00] [__ __ __].

2.4 SURFACE PREPARATION

- A. Protection: Protect adjacent Work areas and finish surfaces from damage during repair mortar application.
- B. Prepare surfaces in accordance with manufacturer's instructions.
- C. Ensure surfaces are clean, sound, and free of laitance, standing water, dirt, duct, grease, oil, efflorescence, paint, curing compounds, form oils, and other surface contaminants.
- D. Remove loose materials.
- E. Prepare concrete substrate to fractured aggregate profile for proper adhesion.
- F. Clean exposed steel reinforcement to white-metal finish and prime with anti-corrosion coating acceptable to product manufacturer.
- G. Saw-cut straight edges along repair area perimeters minimum of 1/4 inch (6 mm) deep to avoid featheredges.

- H. Report cracks that appear in interface area of patch or overlay to Architect, and repair as directed.
- I. Continue expansion and control joints through repair or as directed by Architect.

2.5 MIXING

- A. Mix materials in accordance with manufacturer's instructions.
- B. Mix no more material than can be placed in 20 to 30 minutes at 70 degrees F (21 degrees C) and 50 percent relative humidity.

2.6 APPLICATION

- A. Apply and cure repair mortar in accordance with manufacturer's instructions.
- B. Placement:

Dampen surface with clean water to obtain saturated surface-dry (SSD) with no standing water. Apply small quantity of mixed repair mortar to SSD substrate. Thoroughly key-in and work material throughout cavity to promote bond.

Place repair mortar and key-in and compact thoroughly to secure bond.

Apply repair mortar in lifts of 1/4 inch (6 mm) to 2 inches (51 mm).

Avoid featheredging. For optimum mechanical bond on successive lifts, thoroughly score each lift and allow reaching initial set before next layer is applied.

Trowel repair mortar to desired finish after initial set.

- C. Curing:
 - a. Damp cure for 3 days.
 - b. Use appropriate curing compound if surface cannot be damp cured.

2.7 PROTECTION

- A. Protect repair mortar from damage during construction.
- B. Protect from freezing for minimum of 24 hours after application.

END OF SECTION 04 05 13.91

SECTION 04 20 00 - 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. (To match existing adjacent brick veneer.)
3. Split face CMU (To match existing split face CMU.)
4. Mortar and grout.
5. Steel reinforcing bars.
6. Masonry joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.
10. Cavity-wall insulation.
11. Air and vapor barrier.
12. Ferro shelf angle supports and shelf angles.

B. Related Sections:

1. Division 05 Section "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
2. Division 05 Section "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.

1.3 DEFINITIONS

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

1.4 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: The General Contractor 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. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 4. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
 5. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
 6. Prism Test: For each type of construction required, according to ASTM C 1314.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 2. 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.
 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Verification: For each type and color of the following: (All samples and finishes to match existing.)
1. Exposed CMUs.
 2. Face brick five or more bricks.
 3. Split face CMU sample.
 4. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
 5. Weep holes and vents.
 6. Accessories embedded in masonry.
 7. Ferro shelf angle support and angle sample and delegated design.
- D. Qualification Data: For testing agency.

- E. Material Certificates: For each type and size of the following:
1. Masonry units.
 - a. Include data on material properties, 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.
 - d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 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.
- F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- G. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- H. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

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. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 01 Section "Quality Requirements" for mockups.
 - 1. Build sample panels for typical exterior and interior walls in sizes approximately 60 inches long by 48 inches high by full thickness.
 - 2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
 - 3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
 - 4. Protect approved sample panels from the elements with weather-resistant membrane.
 - 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

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 down both sides of walls and hold cover securely in place.

2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor 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 and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
 - E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in 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. Regional Materials: Provide CMUs that have been manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

- B. 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. (Interior only)
- C. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated. (for split face CMU)
1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) ACM Chemistries; RainBloc.
 - 2) BASF Aktiengesellschaft; Rheopel Plus.
 - 3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.
- D. CMUs: ASTM C 90.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi
 2. Density Classification: Normal weight. (use light weight at new CMU walls at existing shop renovation)
 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
 4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
- E. 16" Rebar light weight CMU (provided by Oneonta Black or Equal)

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. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Division 03 Section "Cast-in-Place Concrete" and with reinforcing bars indicated.
- D. 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: (To match existing brick veneer)
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: Available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Glen-Gery Ashfield Modular – no texture, square edges. Match existing Brick Veneer.
 2. Grade: SW
 3. Type: To match existing.
 4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi.
 5. Initial Rate of Absorption: Less than 30 g/30 sq. in. 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.
 8. Size (Actual Dimensions): To match existing.
 9. Application: Use where brick is exposed unless otherwise indicated.
 10. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.
 11. Color and Texture: To match existing.

2.5 SPLIT FACE CMU

- A. Premium color to be selected; 8" x 4" x 16". To match existing.

2.6 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Provide aggregate for mortar and grout, cement, and lime that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

- B. 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.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Masonry Cement: ASTM C 91.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. WORKRITE Cement
 - b. Lafarge North America Inc.
 - c. Lehigh Cement Company.
 - d. National Cement Company, Inc.; Coosa Masonry Cement.
- F. Mortar 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. WORKRITE Cement
 - b. Lafarge North America Inc.; Lafarge Mortar Cement or Magnolia Superbond Mortar Cement.
- G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. WORKRITE Mortar Pigment
 - b. Davis Colors; True Tone Mortar Colors.
 - c. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
 - d. Solomon Colors, Inc.; SGS Mortar Colors.
- H. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- I. Aggregate for Grout: ASTM C 404.

- J. Refractory Mortar Mix: Ground fireclay or non-water-soluble, calcium aluminate, medium-duty refractory mortar that passes ASTM C 199 test; or an equivalent product acceptable to authorities having jurisdiction.
- K. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 - 1. Products: Subject to compliance with requirements, provide one of 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.
- L. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent by same manufacturer.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ACM Chemistries; RainBloc for Mortar.
 - b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
 - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
- M. Water: Potable.

2.7 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615 or ASTM A 996, Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A 951.
 - 1. Interior Walls: Hot-dip galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 - 3. Wire Size for Side Rods: 9 gauge.
 - 4. Wire Size for Cross Rods: 9 gauge.
 - 5. Wire Size for Veneer Ties: 9 gauge..
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 - 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- 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 wide, plus 1 side rod at each wythe of masonry 4 inches wide or less.
 - a. Wire-bond Series 200 Ladder Mesh (9 gauge) or equal.

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 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. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.
- E. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187-inch- diameter, hot-dip galvanized, carbon-steel continuous wire.

2.8 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. Wire-Bond Sure Tie Tapcon Thermal Anchor min 1-1/2" embedment #4530 and #4590 with #4510 tie.
 2. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 641, Class 1 coating.
 3. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
 4. Galvanized Steel Sheet: ASTM A 653, Commercial Steel, G60 zinc coating.
 5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008, Commercial Steel, with ASTM A 153, Class B coating.
 6. Steel Plates, Shapes, and Bars: ASTM A 36.
- B. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 7.6 to 12.7 mm and an amplitude of 0.06 to 0.10 inch made from 0.060-inch-thick, steel sheet, galvanized after fabrication.
- C. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- D. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
1. Wire-Bond Sure Tie Tapcon Thermal Anchor min 1-1/2" embedment #4530 and #4590 with #4510 tie.
 2. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
 3. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
 4. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls unless otherwise indicated.

- E. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
 - 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- 0.25-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
- F. Partition Top anchors: 0.105-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- G. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
 - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153.

2.9 MISCELLANEOUS ANCHORS

- A. Anchor Bolts: L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of dimensions indicated.
- B. Postinstalled Anchors: Torque-controlled expansion anchors.
 - 1. Load Capacity: 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.
 - 2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 unless otherwise indicated.
 - 3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.10 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
 - 1. Stainless Steel: ASTM A 240, Type 304, 0.016 inch thick.
 - 2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.

3. Fabricate through-wall flashing with drip edge where indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees.

B. Flexible Flashing: Use the following unless otherwise indicated:

1. Wire Bond 4140 Copper Seal Asphalt-Free Copper Seal Flashing: 7-oz./sq. ft. asphalt free copper sheet laminated on both sides with a polymer fabric with Wire-Bond #4200 Termination Bar.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Wire Bond – 4140 Copper Seal with Wire-Bond #4200 Termination Bar.
 - 2) Hohmann & Barnard, Inc.; H & B Copper Fabric NA Asphalt Free Copper Composite Flashing.
 - 3) Advanced Building Products – Copper Fabric Flashing. (Asphalt Free)

C. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to terminate at the wall face, use metal flashing with a drip edge. Wire-Bond #4165 304 Stainless Steel Drip Edge.

D. 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.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Wire-Bond #4165 304 Stainless Steel Drip Edge.

B. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.

C. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or 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.

D. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

E. Weep/Vent Products: Use one of the following unless otherwise indicated:

1. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches long.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Wire-Bond #3503T Clear Rectangular Vent with Stainless Steel Filter and Wick.
 - 2) Hohmann & Barnard, Inc. 342S Rectangular Plastic Weep Vent

- F. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. A Wire-Bond #3611D Cavity Net DR (2”).
 - b. Mortar Net USA, Ltd.; Mortar Net.
 - c. Advanced Building Products Inc.; Mortar Break II. (2”)
 - d. Archovations, Inc.; CavClear Masonry Mat. (2”)
 2. Provide one of the following configurations:
 - a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep that prevent clogging with mortar droppings.
- G. 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 steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
1. Products: Subject to compliance with requirements, provide one of 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.
- H. Top Anchors – Wire-Bond #4301

2.12 CAVITY-WALL INSULATION

- A. Cavity Wall Insulation Polyisocyanurate Board, Foil Faced: ASTM C289, foil faced, Type I, Class 2.
1. R Max Ecomaxci FR Air Barrier with R-Seal 2000LF Liquid Flashing and R-Seal 6000 Tape at Windows and Doors.
 2. Dow Chemical Company – Dow Thermax XArmor with Dow Liquid Armor.
 3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.13 AIR WATER VAPOR BARRIER

- A. Carlisle CCW-705 – Refer to specification section 072713.
- B. Fire retardant composition permits use in many wall assemblies requiring NFPA 285.

2.14 FERO SHELF ANGLE SUPPORTS AND SHELF ANGLES

- A. Shelf angle supports: FERO FAST™ Thermal Bracket system, consisting of FAST™ Thermal [Standard, Lintel, Inverted, TTS, or other custom] Brackets, Rectangular Washers, Shim Rods, and Shim Plates.
1. All components manufactured by FERO Corporation, Edmonton, AB.
 2. FAST™ Thermal Brackets sized accordingly to shelf angle size.
 3. FAST™ Thermal Brackets sized accordingly to anchor diameter (anchor Delegated Design).
 4. FAST™ Thermal Brackets sized accordingly to suit wall assembly.
 5. FAST™ Thermal Brackets to not exceed maximum spacings listed in FERO published load table and technical information, unless directed otherwise by a professional engineer registered or licensed in the local jurisdiction.
- B. Shelf angles: FERO FAST Punched Angle to be used above openings with FAST™ Thermal Lintel Brackets hot dipped galvanized angle to be used with the FAST™ Thermal Standard Brackets
1. FERO FAST Punched Angle to be manufactured by FERO Corporation, Edmonton, AB.
 2. Shelf angles for the FAST™ Thermal Standard Brackets can be supplied locally.
 3. Installer is responsible for sizing FAST™ system to suit wall assembly and field conditions.
- C. FAST™ Thermal Bracket depth to fill wall cavity or as shown in construction documents.
- D. FAST™ Thermal Bracket height to meet anchor to shelf and distance.
- E. FERO shim plates to be used for meeting construction tolerances.
- F. Installer to install FAST™ Thermal Bracket system in compliance with FERO published technical documentation.
- G. Shelf angle thickness and FAST™ Thermal Bracket anchorage requirements to be designed by a professional engineer registered or licensed accordingly to local jurisdiction. (Delegated Design)
- H. All shop drawings relating to shelf angle supports and shelf angles to be reviewed and stamped for approval by a professional engineer registered or licensed accordingly to local jurisdiction, which can be done by contractor or delegated to FERO.
- I. All components to be hot dipped galvanized after fabrication to meet the requirements of ASTM A123 and CSA A370-14

2.15 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.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.16 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 mortar unless otherwise indicated.
 3. For exterior masonry, use portland cement-lime mortar.
 4. For reinforced masonry, use portland cement-lime 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 or needed to provide required compressive strength of masonry.
 1. For masonry below grade or in contact with earth, use Type M.
 2. For above grade walls, use Type S.
 3. For mortar parge coats, use Type S.
 4. For exterior, above-grade for interior non-load-bearing partitions; and for veneers use Type N.
 5. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 1. Pigments shall not exceed 10 percent of portland cement by weight.
 2. Mix to match existing, submit samples to architect for approval.
- E. 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, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

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. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. 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 or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch 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, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch 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 bond pattern indicated on Drawings; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by 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 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. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 - 3. 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.
 - 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and 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.
 - 5. CMU shall be laid in full bed of mortar.

- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 COMPOSITE MASONRY

- A. Bond wythes of composite masonry together using one of the following methods:
 - 1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 4.5 sq. ft. of wall area spaced not to exceed 36 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
 - a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
 - 2. 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 with continuous horizontal wire in facing wythe attached to ties.
 - 3. Header Bonding: Provide masonry unit headers extending not less than 3 inches into each wythe. Space headers not over 8 inches clear horizontally and 16 inches clear vertically.
- B. Bond wythes of composite masonry together using bonding system indicated on Drawings.
- C. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.
- D. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.
 - 1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.
- E. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
 - 1. Provide individual metal ties not more than 8 inches o.c.
 - 2. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.

3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

3.7 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 4.5 sq. ft. of wall area spaced not to exceed 36 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
 - a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
 - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.
 2. 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 with continuous horizontal wire in facing wythe attached to ties.
 - c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
 3. Header Bonding: Provide masonry unit headers extending not less than 3 inches into each wythe. Space headers not over 8 inches clear horizontally and 16 inches clear vertically.
 4. 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. Do not attempt to trowel or remove mortar fins protruding into cavity.
- D. Parge cavity face of backup wythe in a single coat approximately 3/8 inch thick. Trowel face of parge coat smooth.
- E. Apply air and vapor barrier to face of backup wythe to comply with Division 07 Section 072713 "Modified Bituminous Sheet Air Barriers".

- F. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches 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.

3.8 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c. Refer to drawings.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control 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 corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 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 1/2 inch 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 o.c. vertically and 36 inches o.c. horizontally.

3.10 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to masonry backup with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten anchors to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.

3.11 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 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 metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
 - 2. Build flanges of factory-fabricated, expansion-joint units into masonry.
 - 3. Build in compressible joint fillers where indicated.
 - 4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch 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.
 - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.12 LINTELS

- A. Install steel lintels where indicated.
- B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.13 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. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

- B. Install flashing as follows unless otherwise indicated:
1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed 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 on interior face.
 3. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe. Form 1/4-inch hook in edge of flashing embedded in inner wythe.
 4. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under building paper or building wrap, lapping at least 4 inches.
 5. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 6. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 07 Section "Joint Sealants" for application indicated.
 7. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Division 07 Section "Joint Sealants" for application indicated.
 8. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
 9. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
 10. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- E. 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. Space weep holes 24 inches o.c. unless otherwise identified.

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

3.14 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 48 inches.

3.15 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 1 – 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. of wall area or portion thereof.

- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- 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.

3.16 PARGING

- A. Parge exterior faces of below-grade masonry walls, in 2 uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.17 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.

4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean 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.

3.18 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.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 1. Crush masonry waste to less than 4 inches in each dimension.
 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section "Earth Moving."
 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00

SECTION 04 72 00 - ARCHITECTURAL CAST STONE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Scope – All labor, materials and equipment to provide Cast Stone shown on architectural drawings and as described in this specification.
 - 1. Manufacturer shall furnish Cast Stone covered by this specification.
 - 2. Installing contractor shall unload, store, furnish all anchors, set, patch, clean and seal (optional) the Cast Stone as required.

1.2 RELATED SECTIONS

- A. Section 01 33 00 – Submittal Procedures
- B. Section 04 20 00 – Unit Masonry
- C. Section 07 92 00 – Joint Sealants

1.3 REFERENCES

- A. ACI 318 – Building Code Requirements for Reinforced Concrete.
- B. ASTM A 185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- C. ASTM A 615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Reinforced Concrete.
- D. ASTM C 33 – Standard Specification for Concrete Aggregates.
- E. ASTM C 150 – Standard Specification for Portland Cement.
- F. ASTM C 173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volume Method.
- G. ASTM C 231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- H. ASTM C 260 – Standard Specification for Air Entrained Admixtures for Concrete.
- I. ASTM C 270 – Standard Specification for Mortar for Unit Masonry.
- J. ASTM C 426 – Standard Test Method for Linear Shrinkage of Concrete Masonry Units
- K. ASTM C 494 – Standard Specification for Chemical Admixtures for Concrete.

- L. ASTM C 618 – Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Concrete.
- M. ASTM C 666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
- N. ASTM C 979 – Standard Specification for Coloring Pigments for Integrally Pigmented Concrete.
- O. ASTM C 989 – Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete.
- P. ASTM C 1194 – Standard Test Method for Compressive Strength of Architectural Cast Stone.
- Q. ASTM C 1195 – Standard Test Method for Absorption of Architectural Cast Stone.
- R. ASTM C 1364 – Standard Specification for Architectural Cast Stone.
- S. ASTM D 2244 – Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- T. Cast Stone Institute® Technical Manual (Current Edition)

1.4 DEFINITIONS

- A. Cast Stone – a refined architectural concrete building unit manufactured to simulate natural cut stone, used in unit masonry applications.
 - 1. Dry Cast Concrete Products – manufactured from zero slump concrete.
 - a. Vibrant Dry Tamp (VDT) casting method: Vibratory ramming of earth moist, zero-slump concrete against a rigid mold until it is densely compacted.
 - b. Machine casting method: manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.
 - 2. Wet Cast Concrete Products – manufactured from measurable slump concrete.
 - a. Wet casting method: manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.

1.5 SUBMITTAL PROCEDURES

- A. Comply with Section 01 33 00 - Submittal Procedures.
- B. Samples: Submit pieces of the Cast Stone that are representative of the general range of finish and color proposed to be furnished for the project.
- C. Test results: Submit manufacturers test results of Cast Stone previously made by the manufacturer.

- D. Shop Drawings: Submit manufacturers shop drawings including profiles, cross-sections, reinforcement, exposed faces, arrangement of joints (optional for standard or semi-custom installations), anchoring methods, anchors (if required), annotation of stone types and their location.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule.
 - 2. Manufacturer shall submit a written list of projects similar in scope and at least three (3) years of age, along with owner, architect and contractor references.
- B. Standards: Manufacturer to be certified by either Cast Stone Institute or APA for cast stone units.
- C. Mock-up (Optional): Provide full size unit(s) for use in construction of sample wall. The approved mock-up shall become the standard for appearance and workmanship for the project.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CAST STONE

Acceptable Manufacturers:

Sun Precast Company Inc.
4051 Ridge Road
Beaver Springs, PA
Phone: 570-658-8000
www.sunprecast.com

Southside Precast Products
1951 Hamburg Turnpike
Buffalo, NY 14218
Phone: 716-825-9300
Email: southsideprecast.com

- A. Comply with ASTM C 1364
- B. Physical Properties: Provide the following:
 - 1. Compressive Strength – ASTM C 1194: 6,500 psi (45 Mpa), minimum for products at 28 days.
 - 2. Absorption – ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products at 28 days.
 - 3. Air Content – ASTM C173 or C 231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.
 - 4. Freeze-Thaw – ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.

5. Linear Shrinkage – ASTM C 426: Shrinkage shall not exceed 0.065%.
- C. Job Site Testing – One (1) sample from production units may be selected at random from the field for each 500 cubic feet delivered to the job site.
1. Three (3) field cut cube specimens from each of these samples shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as allowed by ACI 318.
 2. Three (3) field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
 3. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.

2.2 RAW MATERIALS

- A. Portland cement – Type I or Type III; white and/or grey; ASTM C 150.
- B. Coarse aggregates – Granite, quartz or limestone, ASTM C 33, except for gradation, and are optional for the VDT casting method.
- C. Fine aggregates – Manufactured or natural sands, ASTM C 33, except for gradation.
- D. Colors – Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.
- E. Admixtures – Comply with the following:
1. ASTM C 260 for air-entraining admixtures.
 2. ASTM C 494 Types A - G for water reducing, retarding, accelerating and high range admixtures.
 3. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
 4. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
 5. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.
- F. Water – Potable
- G. Reinforcing bars:
1. ASTM A 615, Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in.
 2. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.

- H. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless steel Type 302 or 304.

2.3 COLOR AND FINISH

- A. Match sample on file in architect's office.
- B. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. and the density of such voids shall be less than 3 occurrences per any 1 in. 2 and not obvious under direct daylight illumination at a 5 ft. distance.
- C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft. distance.
 - 1. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
 - a. Total color difference – not greater than 6 units.
 - b. Total hue difference – not greater than 2 units.
- D. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft. distance.
- E. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.
- F. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

2.4 REINFORCING

- A. Reinforce the units as required by the drawings and for safe handling and structural stress.
- B. Minimum reinforcing shall be 0.25 percent of the cross section area.
- C. Reinforcement shall be non-corrosive where faces exposed to weather are covered with less than 1.5 in. of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.
- D. Panels, soffits and similar stones greater than 24 in. in one direction shall be reinforced in that direction. Units less than 24 in. in both their length and width dimension shall be non-reinforced unless otherwise specified.
- E. Welded wire fabric reinforcing shall not be used in dry cast products.

2.5 CONNECTION MATERIALS

- A. Steel Shapes and Plates: Complying with ASTM A 36.
- B. Malleable Iron Castings: Complying with ASTM A 47.

- C. Carbon Steel Plates: Complying with ASTM A 283.
- D. High Strength, Low Alloy Structural Steel: Complying with ASTM A 572.
- E. Carbon Steel Structural Tubing: Complying with ASTM A 500, Grade B.
- F. Anchor Bolts: Complying with ASTM A 307, carbon steel or ASTM A 325 (ASTM, high strength; bolts nuts, and washers).
- G. Welded Headed Studs: Complying with AWS D1.1, Type B.
- H. Deformed Steel Wire Bar Anchors: Complying with ASTM A 496.
- I. Stainless Steel Plate: Complying with ASTM F 593, Type 304 or Type 316; bolts and studs, nuts and washers. Note that selection of stainless steel will result in increased costs.
- J. Finish for Steel Connection Materials:
 - 1. Hot-dip galvanize steel exposed to weather in final assembly complying with ASTM A 123 or ASTM A 153.
 - 2. Shop Prime Remaining Steel Shapes: Complying with SSPC Paint 25.
 - 3. Anchor Bolts, Nuts, Washers, Cadmium Plated: Complying with ASTM A 563, Grade C.
 - 4. Hot-dip galvanize setting bolts or projecting steel in masonry applications complying with ASTM A 153.
 - 5. Galvanizing Repair Paint: Complying with DOD P-21035A or SSPC Paint 20.
 - 6. Welding Electrodes: Comply with AWS Standards.

2.6 MANUFACTURING TOLERANCES

- A. Cross section dimensions shall not deviate by more than $\pm 1/8$ in. from approved dimensions.
- B. Length of units shall not deviate by more than length/ 360 or $\pm 1/8$ in., whichever is greater, not to exceed $\pm 1/4$ in.
 - 1. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.
- C. Warp, bow or twist of units shall not exceed length/ 360 or $\pm 1/8$ in., whichever is greater.
- D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, $1/8$ in., on unformed sides of unit, $3/8$ in. maximum deviation.

2.7 PRODUCTION QUALITY CONTROL

- A. Testing:
 - 1. Test compressive strength and absorption from specimens selected at random from plant production.
 - 2. Samples shall be taken and tested from every 500 cubic feet of product produced.
 - 3. Perform tests in accordance ASTM C 1194 and C 1195.

4. New and existing mix designs shall be tested for strength and absorption compliance prior to producing units.

2.8 DELIVERY, STORAGE AND HANDLING

- A. Mark production units with the identification marks as shown on the shop drawings.
- B. Package units and protect them from staining or damage during shipping and storage.
- C. Provide an itemized list of product to support the bill of lading.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installing contractor shall check Cast Stone materials for fit and finish prior to installation. Do not set unacceptable units.

3.2 SETTING TOLERANCES

- A. Comply with Cast Stone Institute® Technical Manual.
- B. Set stones 1/8 in. or less, within the plane of adjacent units.
- C. Joints, plus - 1/16 in., minus - 1/8 in.

3.3 JOINTING

- A. Joint size:
 1. At stone/brick joints 3/8 in.
 2. At stone/stone joints in vertical position 1/4 in. (3/8in. optional).
 3. Stone/stone joints exposed on top 3/8 in.
- B. Joint materials:
 1. Mortar, Type N, ASTM C 270.
 2. Use a full bed of mortar at all bed joints.
 3. Flush vertical joints full with mortar.
 4. Leave all joints with exposed tops or under relieving angles open for sealant.
 5. Leave head joints in coping and projecting components open for sealant.
- C. Location of joints:
 1. As shown on shop drawings.
 2. At control and expansion joints unless otherwise shown.

3.4 SETTING

- A. Drench units with clean water prior to setting.
- B. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
- C. Set units in full bed of mortar, unless otherwise detailed.
- D. Rake mortar joints 3/4 in. for pointing.
- E. Remove excess mortar from unit faces immediately after setting.
- F. Tuck point unit joints to a slight concave profile.

3.5 SEALING

- A. Field apply silane sealer after installation to protect against salt/de-icing chemicals ,etc.
- B. Manufacturer: Armor SX 5000 WB

3.6 JOINT PROTECTION

- A. Comply with requirements of Section 07 90 00.
- B. Prime ends of units, insert properly sized backing rod and install required sealant.

3.7 REPAIR AND CLEANING

- A. Repair chips with touchup materials furnished by manufacturer.
- B. Saturate units to be cleaned prior to applying an approved masonry cleaner.
- C. Consult with manufacturer for appropriate cleaners.

3.8 INSPECTION AND ACCEPTANCE

- A. Inspect finished installation according to Bulletin #36.
- B. Do not field apply water repellent until repair, cleaning, inspection and acceptance is completed.

END OF SECTION 04 72 00

SECTION 05 12 00 - 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.
- B. The drawings and specification are complimentary. What shall be required by one, shall be binding as if required by both. In the event of a conflict, the Contractor shall immediately notify the Engineer who shall provide clarification.

1.2 SUMMARY

- A. Section Includes: all labor, materials, tools, equipment and services to complete Structural Steel Framing.
 - 1. Structural steel
 - 2. Non-Shrink Grout
 - 3. Shear connectors
- B. Related Requirements:
 - 1. Section 05 31 00 "Steel Decking" for field installation of shear connectors through deck.
 - 2. Section 05 50 00 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other steel items not defined as structural steel.
 - 3. Section 05 32 00 "Natatorium Roof Decking" for acoustic roof deck on high roof above Natatorium.
 - 4. Section 04 20 00 "Unit Masonry" for installing bearing plates in unit masonry.

1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 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 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.

- C. Coordinate all opening sizes and locations with trade contractors.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. General:
 - a. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - b. Include embedment Drawings.
 - c. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - d. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
 - e. Resubmission of shop drawings shall be clouded to indicate changes.
 - 2. Submissions:
 - a. Anchor bolt and embedment Plan and Details FIRST
 - b. Erection Plans and Sections SECOND
 - c. Beam Details THIRD
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
 - 1. Power source (constant current or constant voltage).
 - 2. Electrode manufacturer and trade name.
- D. Delegated-Design Submittal: All structural-steel connections shall be designed by Fabricators Engineer to resist design loads, include analysis data signed and sealed by the qualified professional engineer registered in the State of the project.
 - 1. Beam and girder connections shall be designed to support a minimum reaction determined by the formula $Wc/2L$ as defined by the AISC Manual of Steel Construction or the reaction shown on the drawing whichever is greater.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Erector, Fabricator, Fabricator's Engineer, Steel Detailer and testing agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

- D. Mill test reports for structural steel, including country of origin chemical and physical properties.
- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 3. Shop primers.
 - 4. Nonshrink grout.
- F. Survey of existing conditions.
- G. Source quality-control reports.
- H. Field quality-control and special inspection reports.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU.
- B. Erector Qualifications: A qualified erector who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Shop-Painting Applicators: Qualified according to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."
 - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- E. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using High Strength Bolts."

1.8 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 corrosion and deterioration.

1. 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.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
1. Clean and relubricate bolts and nuts that become dry or rusty before use.
 2. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide complete details of all connections which shall be designed by Fabricators Engineer, including comprehensive engineering analysis, to withstand loads indicated and comply with other information and restrictions indicated.
1. Select and complete connections using AISC 360.
 2. Use Allowable Stress Design; data are given at service-load level.
- B. Moment Connections: Type FR – fully restrained.
- C. Construction: Moment Frame

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992, Grade 50.
- B. Channels, Angles: ASTM A 36.
- C. Plate and Bar: ASTM A 36.
- D. Cold-Formed Hollow Rectangular Structural Sections: ASTM A 500, Grade C, structural tubing, $F_y = 50$ KSI.
- E. Steel Pipe: ASTM A 53, Type E or Type S, Grade B.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM F 3125, Type 1, heavy-hex Grade A 325 steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
- B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM F 3125, Type 1, heavy-hex Grade A 325 steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating.
- C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 3125, Type 1, Grade A 325, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
1. Finish: Plain and Mechanically deposited zinc coating.
- D. Anchor Rods: ASTM F 1554, Grade 36, weldable.
1. Configuration: Straight.
 2. Nuts: ASTM A 563 heavy-hex carbon steel.
 3. Plate Washers: ASTM A 36 carbon steel, oversized.
 4. Washers: ASTM F 436, Type 1, hardened carbon steel.
 5. Finish: Hot-dip zinc coating, ASTM A 153, Class C.
- E. Structural expansion bolts for hollow structural sections – Lindapter Hollo-Bolt Type HB or LNA Solutions Box Bolt.
- F. Shear Connectors: ASTM A108 Grades 1015 through 1020, headed-stud type, cold finished carbon steel; AWS D1.1, Type B.

2.4 PRIMER

- A. Primer: Comply with Division 9 Painting requirements.
- B. Primer: SSPC-SP2, Sherwin Williams Pro-Industrial Pro-Cryl.
- C. Galvanizing Repair Paint: MPI#18, ASTM A 780.

2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
 1. Euclid NS by Euclid Chemical
 2. DuragROUT by L&M Construction Chemicals

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 1. Camber structural-steel members where indicated.
 2. Fabricate beams with rolling camber up.
 3. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
 4. Mark and match-mark materials for field assembly.

5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. 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.
 - C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
 - D. Finishing: Accurately finish (mill) ends of columns, splices and other members transmitting bearing loads.
 - E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."
 - F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel 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, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.
 - 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.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High Strength Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.8 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.
 2. Surfaces to be field welded.
 3. Surfaces of high-strength bolted, slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 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 minimum dry film thickness of 2.0 mils. 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 surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Prepare steel and apply a one-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 2.0 mils.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. Galvanize lintels located in exterior walls.

2.10 SHOP QUALITY CONTROL

- A. Testing Agency: Owner shall engage a qualified testing agency to perform SHOP tests and inspections.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Ultra-sonic Inspection ASTM E164
 - 3. Inspect a minimum of 25% welds. If failure rate exceed 25%, test all welds.
- D. Prepare test and inspection reports.
- E. Refer to drawings for additional requirements.

- F. In addition to visual inspection, test and inspect 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 according to requirements in AWS D1.1 on additional shear connectors if weld fracture occurs on shear connectors already tested.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified 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 existing conditions. Include 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 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.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303, AISC 360 and OSHA Safety Standards for Steel Erection.
- B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on non-shrink grout.
 - 2. 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 plate before packing with grout.
 - 3. Weld plate washers to base plates.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are 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. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. 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.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High Strength Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections and Testing: Owner shall engage a qualified special inspector to perform the following special inspections and perform tests:
 - 1. Verify structural-steel materials and inspect steel frame joint details.
 - 2. Verify weld materials and inspect welds.
 - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect field welds according to AWS D1.1.

1. In addition to visual inspection, test and inspect field welds according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Ultra-sonic Inspection: ASTM E164.
 - c. Inspect a minimum of 25% of field welds. If failure rate exceeds 25%, inspect all field welds.

- D. SHERA Stud Connectors: In addition to visual inspection, test and inspect fielded-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.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

- C. Any field modifications to members or connections shall be provided to the Engineer of Record in sketch form and shall be signed and sealed by Fabricator's Engineer.

END OF SECTION 05 12 00

SECTION 05 31 00 - 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.
- B. The drawings and specification are complimentary. What shall be required by one, shall be binding as if required by both. In the event of a conflict, the Contractor shall immediately notify the Engineer who shall provide clarification.

1.2 SUMMARY

- A. Section Includes all labor, materials, tools, equipment and services to complete Steel Decking.
 - 1. Roof deck.
 - 2. Composite floor deck
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for normal-weight and structural concrete fill over steel deck.
 - 2. Section 05 12 00 "Structural Steel Framing" for shop- and field-welded shear connectors.
 - 3. Section 05 50 00 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
 - 4. Section 05 32 00 "Natatorium Roof Decking" for acoustic roof deck on high roof above Natatorium.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings:
 - 1. Include layout plans separate from joist plans and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, deck closures, pour stops, butt strips, finish strips, reinforcement plates, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.

- C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Powder-actuated mechanical fasteners.
- D. Evaluation Reports: For steel deck, from ICC-ES.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3 "Structural Welding Code - Sheet Steel."

1.6 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 PERFORMANCE REQUIREMENTS

- A. 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."
- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 COMPOSITE FLOOR DECK

- A. Manufacturers:
 - 1. Canam Steel Corporation
 - 2. New Millennium Building Systems
 - 3. Nucor Corporation

- B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specification and Commentary for Composite Steel Floor Deck", in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A653, Structural Steel (SS), Grade 33, G90 zinc coating.
 - 2. Profile Depth: 2 inches.
 - 3. Design Uncoated-Steel Thickness: 0.0358 inch (20 gauge).
 - 4. Span Condition: Triple span or more.

2.3 ROOF DECK

- A. Manufacturers:
 - 1. Canam Steel Corporation
 - 2. New Millennium Building Systems
 - 3. Nucor Corporation
- B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G90 zinc coating.
 - 2. Deck Profile: Type WR, wide rib.
 - 3. Profile Depth: 1-1/2 inches.
 - 4. Design Uncoated-Steel Thickness: 0.0358 inch. (20 gauge)
 - 5. Span Condition: Triple span or more.
 - 6. Side Laps: Overlapped.

2.4 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners complying with AISI 1070 Modified with minimum Rockwell Hardness of C54.5 with knurled shank and forged ballistic point.
 - 1. Hilti fasteners:
 - a. Type X-HSN-24 to joists and angles
 - b. Type X-ENP-19 to beams and girders
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- G. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.
- H. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.
- I. Deck reinforcement plates: Galvanized 16" x 16" x 16 gauge at all roof penetrations smaller than 13" x 13".
- J. Column closures, end closures, Z-closures and cover plates; sheet steel, of same material and finish and thickness as deck.

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 of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, 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.
 - 1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.
- 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 for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 FLOOR-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Diameter: 3/4 inch nominal.
 - 2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches and as follows:
 - 1. Fasten with a minimum of 1-1/2-inch-long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches with end joints as follows:
 - 1. End Joints: Butted
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- E. Floor Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.4 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to all steel supporting members as follows:
 - 1. Arc spot (puddle) welds with 3/4" nominal surface diameter - or - Hilti fasteners.
 - 2. Fasten to all roof perimeter edges at 6" on-center.
 - 3. Fasten to all edges of openings at 18" on-center.
 - 4. Within 10 feet of all roof edges and corners, fasten in 36/7 pattern.
 - 5. Within field of roof, fasten in 36/4 pattern.
- 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 diameter or larger, carbon-steel screws.
 - 2. Within 10 feet of all roof edges and corners at 24 inches on-center maximum.

3. Within field of roof at 36 inches on-center maximum.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 1. End Joints: Lapped 2 inches minimum
- D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- E. 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.
- F. Deck reinforcement plates: Install at each roof penetration smaller than 13" x 13" using 8 - #10 screws. Coordinate locations with trades.
- G. There shall be no hanging of any items such as ceilings, conduits, piping, ductwork, etc., from the roof deck.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner shall engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Prepare test and inspection reports.
- D. Refer to drawings for additional requirements.

3.6 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.

END OF SECTION 05 31 00

SECTION 05 32 00 - NATATORIUM ROOF 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.
- B. The drawings and specification are complimentary. What shall be required by one, shall be binding as if required by both. In the event of a conflict, the Contractor shall immediately notify the Engineer who shall provide clarification.

1.2 SUMMARY

- A. Section Includes all labor, materials, tools, equipment and services to complete Natatorium Roof Decking.
 - 1. The roof deck and ceiling system shall serve as a structural roof deck and a finished ceiling as indicated on the contract drawings.
 - 2. The roof deck and ceiling system shall provide an exposed bottom surface that is substantially flat. The narrow rib openings of the roof deck and ceiling system shall provide the appearance of a linear ceiling. Fasteners for sidelaps and overlying roofing materials shall be concealed within the depth of the dovetail shaped ribs.
 - 3. Hanging devices with locks that are specially configured to fit into the dovetail shaped ribs of the roof deck and ceiling system shall be obtained from the deck manufacturer. These hanging devices shall be utilized whenever any related work is suspended from the roof deck and ceiling system. **Hanging devices shall be furnished by the installer of the related work** unless otherwise indicated. Locks providing positive confinement in two perpendicular planes shall be provided.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for normal-weight and structural concrete fill over steel deck.
 - 2. Section 05 50 00 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
 - 3. Section 09 91 23 "Interior Painting" for field painting of deck.

1.3 REFERENCE STANDARDS

- A. Section properties shall be computed in accordance with the American Iron and Steel Institute (AISI) Specification for Design of Cold-Formed Steel Structural Members.
- B. Welding shall comply with the applicable provisions of the American Welding Society (AWS) D1.3 Structural Welding Code-Sheet Steel.

- C. Superimposed load and diaphragm shear capacities shall be computed in accordance with the requirements of the Steel Deck Institute (SDI).
- D. The manufacturer shall have been regularly engaged in the production of a deck section with dovetail shaped ribs for a period of at least ten years.
- E. Noise reduction coefficients shall be verified by the result of sound absorption tests conducted in accordance with ASTM C423 and E795.
- F. Acoustical roof deck specified shall have been tested and approved by Factory Mutual Research Corporation for use in Class I insulated steel deck roof construction without the use of Dens-dek or similar product as a fire barrier. Deck shall be listed in the FM Approval Guide. All panels shall bear the appropriate FM approved label.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated. Including manufacturers specifications, section properties, load tables, diaphragm shear tables, dimensions finish, noise reduction , hangers.
- B. Shop Drawings:
 - 1. Include layout plans of deck panels indicating anchorage details, reinforcing channels, cut deck openings, special jointing, deck closures, butt strips, finish strips, reinforcement plates, accessories, and attachments to other construction.
- C. Sample:
 - 1. A full width sample with hangers shall be submitted for approval.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3 "Structural Welding Code - Sheet Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1.8 SUBSTITUTION

- A. Reference in the specification to any product, material, type or form of construction shall establish the minimum standard of quality and performance. These standards shall not be abridged or modified for any reason for the purpose of substitution.
- B. The contractor shall submit any proposed substitution in writing to the Architect of Record for consideration no less than ten calendar days prior to the original bid date. The substitution proposal package shall include, at the architect's option, a sample product, structural and performance data, and finish description.
- C. This data will be coordinated and reviewed by the project design professionals. Acceptance of any submitted substitution will be so stated and defined by addendum prior to the original bid date. Substitution without addendum is not accepted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. 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."

2.2 MANUFACTURER

- A. In accordance with the requirements of this specification section, the design is based on Toris-A (acoustical) roof deck / ceiling panels as manufactured by EPIC METALS CORPORATION, Rankin, PA.
- B. The roof deck panels, design thickness, section properties, and (where applicable) NRC shall be shown on the structural design drawings. Deck depth shall be 2.5" x 24" width having (four) 6" o.c. repeat plank widths across, Minimum Section Properties (20 gage) shall be: $I_p = .73$, $S_p = 0.47$, $S_n = 0.42$, weight 2.7 lbs. per sq.ft.

2.3 MATERIAL

- A. The roof deck panels shall be cold-formed from steel coils conforming to ASTM A653, structural quality, with minimum yield strength of 40 ksi.
- B. Before forming, the steel coils shall have received a hot-dip protective coating of zinc conforming to ASTM A924, Class G90, as defined in ASTM A653.
- C. The minimum uncoated thickness of the steel furnished shall not be less than 95% of the design thickness.

2.4 ACCESSORIES

- A. Hanging devices specific to the deck profile shall be obtained by the trade contractors from the deck manufacturer, shall be installable and relocatable along the length of the interior ribs of the roof deck panels. The manufacturer's product data shall be consulted for minimum spacing, load capacities, and proper installation procedure of the hanging devices.
- B. The manufacturer's standard ridge plates, valley plates, transition plates, and closures shall be provided as indicated on the structural drawings.
- C. Openings and reinforcement for openings shall be provided. Access Panels shall be provided in design locations to be coordinated by the Architect, Engineer, and Manufacturer. Access panels shall be provided only in the center one-third of any given deck sheet. No access panels shall be allowed adjacent to the sidelap of any deck sheet. Access panels shall have supplemental elements above the respective panel for the purpose of attaching and securing the panel.
- D. For acoustic deck, encapsulated acoustic elements shall be provided for installation above the perforations in the bottom flat area of the acoustic deck between the dovetail shaped ribs. To facilitate field painting of the perforated sheets, the sound absorbing elements shall be supported above the surface by non-corrosive spacers. Sound absorbing elements and spacers shall be furnished under this specification section for installation by the roofing or other contractor.
- E. Air Dams shall be provided by the deck Manufacturer in the plan locations where roof deck panels transition from the interior to the exterior of the building in a cantilever or externally supported condition. Air Dams shall be designed to prevent air movement from the unconditioned exterior space to the conditioned interior space. Both Transverse and Longitudinal Air Dams shall be provided.
- F. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, stainless-steel screws, No. 12 minimum diameter, carbon tipped.

2.5 FABRICATION

- A. The roof deck and ceiling system panels shall have continuous dovetail shaped ribs.
- B. The roof deck and ceiling system panels shall have full depth positive registering sidelaps.
- C. The acoustical roof deck and ceiling system panels shall be fabricated with perforations. The perforated areas shall be located in the bottom flat areas and the curved "reveal" areas between the dovetail shaped ribs. A minimum NRC value of 0.95 shall be provided. This value shall be established by sound absorption tests without the use of fiberglass insulation above the panels in accordance with ASTM C423 and E795.
- D. The top and bottom surfaces of the roof deck panels shall be prime painted with manufacturer's standard two coat white primer at the factory. Before painting, the galvanized steel shall be chemically cleaned, pretreated with an acid wash, and coated with a 0.2 mil epoxy primer, oven cured then followed by a second coat of a minimum 0.5 mil polyester prime paint then oven cured. Compatibility of field applied finish paint with factory applied prime paint shall be the responsibility of the painting contractor.

PART 3 - EXECUTION

3.1 GENERAL

- A. The roof deck and ceiling system shall be installed in strict accordance with the manufacturer's instructions, approved erection drawings, and all applicable safety regulations. Coordinate length of fasteners for roofing and thermal insulation to avoid penetrating the lower surface of the deck / ceiling.

3.2 BEFORE INSTALLATION

- A. The supporting frame and other work relating to the roof deck shall be examined to determine if this work has been properly completed.
- B. Bundles of material shall be located on the supporting frame in such a manner that overloading of any individual framing members does not occur.
- C. All components of the roof deck shall be protected from significant damage during shipment and handling. If storage at the jobsite is required, bundles or packages of these materials shall be elevated above the ground, sloped to provide drainage, and protected from the elements with a ventilated, waterproof covering.

3.3 INSTALLATION

- A. Before being permanently fastened, the roof deck panels shall be placed on the supporting frame and adjusted to final position with ends accurately aligned and adequately bearing on the supporting frame. Consistent coverage shall be maintained so that panels located in adjacent bays will be properly aligned.
- B. Cutting of the roof deck panels to suit jobsite conditions shall be performed in a neat and professional manner. Only those openings indicated on the structural drawings shall be cut.
- C. The roof deck panels shall be fastened to all supporting members with 3/4" diameter puddle welds at a nominal spacing of 6" on center within 10 feet of roof edge and at 8" on center in the field.
 - 1. The sides of the roof deck panels located at the perimeter of the building shall be fastened to supporting members with 3/4" diameter puddle welds at a maximum spacing of 12" on center or less as indicated on the manufacturer's erection drawings.
- D. The sidelaps of the roof deck panels shall be fastened together with #12 stainless steel, carbon tipped screws as at 12" on center.
- E. Construction loads shall not be applied to the roof deck panels until after the panels are permanently fastened to supporting members, and sidelaps are attached. The construction loads shall not exceed the capacity of the panels.
- F. Items such as ceilings, light fixtures, conduit, pipe and ductwork shall not be suspended from the roof deck panels without specific approval of the structural engineer.

- G. Ridge plates, valley plates, transition plates, eave plates, and reinforcement for openings shall be fastened at 12” on center.

3.4 AFTER INSTALLATION

- A. Construction loads that could damage the roof deck such as heavy concentrated loads and impact loads shall be avoided. Planking shall be used in all high traffic areas.
- B. Galvanizing and other coatings that are damaged must be field repaired using appropriate methods and shall be the responsibility of the damaging contractor to the satisfaction of the Architect.
- C. Cleaning the bottom surface of the roof deck for field painting shall be the responsibility of the General Contractor.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner shall engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Prepare test and inspection reports.
- D. Refer to drawings for additional requirements.
- E. Deck shall be inspected for damage to finish and touch-up prior to installation of insulation.

END OF SECTION 05 32 00

SECTION 05 40 00 - COLD-FORMED 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. Exterior non-load-bearing wall framing.
2. Soffit framing.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for masonry shelf angles and connections.
2. Section 09 22 16 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.

B. Shop Drawings:

1. Provide Shop Drawings prepared by cold-formed steel framing manufacturer.
2. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
3. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

- C. Delegated-Design Submittal: For cold-formed steel framing.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.

- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by manufacturer.
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.
- D. Research Reports:
 - 1. For cold-formed steel framing from a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Steel framing manufacturer to have a third-party evaluation report for its products that are reviewed to the local building code or its model code (Latest Version IBC Adopted).

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Member in good standing of the Steel Framing Industry Association (SFIA).
 - 1. Products to be certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98 IAS Accreditation Criteria for Inspection Agencies.
- B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- C. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- E. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."
- F. Comply with AISI S100 "Specification for the Design of Cold-Formed Steel Structural Members" and AISI S240 "Standard for Cold-Formed Steel Structural Framing."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

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. ClarkDietrich.
 - 2. Marino WARE.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. DESIGN LOADS:

a. WIND LOAD DESIGN DATA:

Basic Wind Speed, Velocity	120 MPH
Exposure	C
Wind Importance Factor (I _w)	(1.00)
Risk Category	III

- 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
- 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
- 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1/2 inch.
- 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

- C. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S240.

- D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: CP60: G60 (Z180), A60 (ZF180), AZ50 (AZM150), or GF30 (ZGF90).
- C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: [CP60: G60 (Z180), A60 (ZF180), AZ50 (AZM150), or GF30 (ZGF90)] [CP90: G90 (Z275), AZ50 (AZM150), or GF45 (ZGF135)].

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Steel Thickness: 0.0677 inch.
 - 2. Flange Width: 2 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Steel Thickness: Matching steel studs.
 - 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ClarkDietrich.
 - b. Marino WARE

- D. Slotted Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; punched with vertical slots in both legs. Studs should be positively attached to deep-leg track using vertical slots while allowing free vertical movement. Legs designed to support horizontal and lateral loads and transfer them to the primary structure, as follows:
1. Product: ClarkDietrich; MaxTrak Slotted Deflection Track or comparable product.
 2. Leg Dimension: [2-1/2 inches with 1-1/2-inch] [3 inches with 2-inch] slot.
 3. Minimum Thickness: [0.0329 inch] [0.0428 inch] [0.0538 inch] [0.0677 inch].
- E. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
1. Minimum Base-Steel Thickness: 0.0677 inch.
 2. Flange Width: 1 inch plus the design gap for one-story structures and 1 inch plus twice the design gap for other applications.
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 STUD FRAMING

- A. Stud Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
1. Minimum Base-Steel Thickness: 0.0428 inch.
 2. Flange Width: 1-5/8 inches, minimum.

2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 - a. Product: ClarkDietrich; [Spazzer 5400 Bridging Bar (SPZS)] [Spazzer Bar Guard (SPBG)] or comparable product.
 3. Web stiffeners.
 - a. Product: ClarkDietrich; Quick Twist Web Stiffener (QTWS) or comparable product.

4. Anchor clips.
 - a. Product: ClarkDietrich; [Holdown (CD Series)] [Moment Clip (MC Series)] or comparable product.
5. End clips.
6. Foundation clips.
 - a. Product: ClarkDietrich; Pony Wall [LGPW24] [LGPW36] [LGPW48] [LGPW60] [PW24] [PW36] [PW48] or comparable product.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Hole reinforcing plates.
10. Backer plates.

2.7 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon- steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B and ASTM A 780.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.9 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
 - 1. Product: ClarkDietrich; Panel Lift Clip (PLC) or comparable product.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing 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. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to ASTM C1007, AISI S240, and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 07 21 00 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Connect vertical deflection clips to bypassing or infill studs and anchor to building structure.
 - 3. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 50 00 - 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. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Shelf angles.
4. Aluminum Ladders

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Division 05 Section "Structural Steel Framing."

1.3 PERFORMANCE REQUIREMENTS

- A. 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, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

C. Welding certificates.

- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 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."

1.6 PROJECT CONDITIONS

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

1.7 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 anchorages and steel weld plates and angles for casting into concrete. 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.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- 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.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

2.3 NONFERROUS METALS

- A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.4 FASTENERS

- A. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- B. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- C. Eyebolts: ASTM A 489.
- D. Machine Screws: ASME B18.6.3.
- E. Lag Screws: ASME B18.2.1.
- F. Plain Washers: Round, ASME B18.22.1.
- G. Lock Washers: Helical, spring type, ASME B18.21.1.
- H. Anchors, General: 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.
- I. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron, or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- J. Post-Installed Anchors: Torque-controlled expansion anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- 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. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 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 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 will be 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.
 - 1. 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, with a minimum 6-inch

embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.7 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. 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.

2.8 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
 - 1. Provide mitered and welded units at corners.
 - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. Galvanize shelf angles located in exterior walls.
- C. Prime shelf angles located in exterior walls with zinc-rich primer.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.
- E. Field cutting is not allowed.

2.9 ALUMINUM LADDERS

- A. Ladders: Provide assembled ladders that comply with OSHA and local building codes, with all edges rounded, clean, smooth, and burr free; dimensions as indicated on drawings.
 - 1. Manufacturers:
 - a. Precision Ladders, Inc.
 - b. Alco-Lite Industrial Products
 - c. Royalite Manufacturing, Inc.

- B. Ladder Treads: Extruded aluminum, 6063-T5 alloy, with self-cleaning serrated top surface and rounded front and back edges; fastened to handrails with concealed stainless steel screws; capable of withstanding 1200 pounds load per thread without damage.
 - 1. Cross Section for Vertical Ladders: Minimum 2 inches horizontal, nominal 1 inch vertical.
 - 2. Cross Section for Ship's Ladders: Minimum 4 inches horizontal, nominal 1 inch vertical.
 - 3. Width: 24 inches
 - 4. Width: 18 inches
 - 5. Spacing: 12 inches vertically
 - 6. Landings: Made up of tread members mounted side-by-side.

- C. Extended Rails: 0.875 inch diameter aluminum tubing; formed with two parallel tubes for each length of rail, with radiused corners, assembled by welding or with stainless steel fasteners.
 - 1. Lift-Up Rail Extensions for Hatch Ladders: 6063-T5 aluminum, .77 inch x 3.646 inches extrusion inside the standard side rails, manually raised, lowered by means of releasing gravity latches; and extending a minimum of 42 inches above top ladder tread.
 - 2. At Top of Ladders Leading to Roofs or Landings: Extending minimum of 42 inches vertically above top of parapet or landing and extending minimum of 10 inches past edge of roof or landing; with free walk-through onto roof/landing.

- D. Security Door:
 - 1. Installed by ladder manufacturer.
 - 2. Extruded aluminum

- E. Anchor Bolts: Hot-dipped galvanized or stainless steel bolts; diameter as specified by ladder manufacturer; length as required to provide adequate anchorage into substrate.

2.10 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.

2.11 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for

each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer.
- E. Field cutting is not allowed.

2.12 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.

2.13 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.14 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.
 - 1. Shop prime with universal shop primer unless indicated.

2.15 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

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.

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.

3.3 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 dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 50 00

SECTION 05 51 19 - METAL GRATING STAIRS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Industrial Class stairs with steel-grating treads.
 - 2. Steel railings and guards attached to metal stairs.

1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

1.3 ACTION SUBMITTALS

- A. Product Data: For metal grating stairs and the following:
 - 1. Gratings.
 - 2. Shop primer products.
 - 3. Grout.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachment to other work.
 - 2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
- C. Delegated-Design Submittal: For stairs, railings, and guards, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the State in which Project is located.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification.
 - 1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
 - 2. Protect steel members and packaged materials from corrosion and deterioration.
 - 3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
 - a. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design stairs, railings, and guards, including attachment to building construction.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform Load: 100 lbf/sq. ft..
 - 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
 - 5. Limit deflection of treads, platforms, and framing members to L/360.
- C. Structural Performance of Railings and Guards: Railings and guards, including attachment to building construction, 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. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.

- b. Infill load and other loads need not be assumed to act concurrently.
- 3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- D. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Component Importance Factor:

2.2 METALS

- A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components 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 A36.
- C. Steel Bars for Grating Treads: ASTM A36 or steel strip, ASTM A1011 or ASTM A1018.
- D. Steel Wire Rod for Grating Crossbars: ASTM A510/A510M.
- E. Aluminum Bars for Grating Treads: ASTM B221 extruded aluminum, alloys as follows:
 - 1. 6061-T6 or 6063-T6, for bearing bars of gratings and shapes.
 - 2. 6061-T1, for grating crossbars.
- F. Steel Tubing for Railings and Guards: ASTM A500 (cold formed), or ASTM A513.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- G. Steel Pipe for Railings and Guards: ASTM A53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
- H. Provide galvanized finish for exterior installations and where indicated.
- I. Cast Iron: Either gray iron, ASTM A48, or malleable iron, ASTM A47, unless otherwise indicated.

2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls.
 - 1. Select fasteners for type, grade, and class required.

- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
 - 1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for exterior stairs indicated to be galvanized.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Electrodes: Comply with AWS requirements.
- B. Zinc-Rich Primer: Comply with SSPC-Paint 20, Type II, Level 2, and compatible with topcoat.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20, ASTM A780 and compatible with paints specified to be used over it.
- D. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for exterior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, railings, guards, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Assemble stairs, railings, and guards in shop to greatest extent possible.
 - 1. Disassemble units only as necessary for shipping and handling limitations.
 - 2. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.

- F. Weld connections 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. Weld exposed corners and seams continuously unless otherwise indicated.
 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish # 3 - Partially dressed weld with spatter removed.

2.6 FABRICATION OF STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Industrial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
1. Fabricate stringers of steel channels.
 - a. Stringer Size: As required to comply with "Performance Requirements" Article.
 - b. Provide closures for exposed ends of channel stringers.
 - c. Finish: Painted Galvanized.
 2. Construct platforms and tread supports of steel channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.
 - a. Provide closures for exposed ends of channel framing.
 - b. Finish: Painted Galvanized.
 3. Weld stringers to headers; weld framing members to stringers and headers.
- C. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."
1. Fabricate treads and platforms from welded steel or pressure-locked steel grating with 1-1/4-by-3/16-inch bearing bars at 15/16 inch o.c. and crossbars at 4 inches o.c.
 2. Fabricate treads and platforms from welded steel or pressure-locked steel grating with openings in gratings no more than 1/2 inch in least dimension.
 - a. Surface: Serrated.
 - b. Finish: Galvanized.
 3. Fabricate grating treads with cast-abrasive nosing and with steel angle or steel plate carrier at each end for stringer connections.
 - a. Secure treads to stringers with bolts.
 4. Fabricate grating platforms with nosing matching that on grating treads.
 - a. Secure grating to platform framing by welding.

- D. Risers: Solid Checker Plate.

2.7 FABRICATION OF STAIR RAILINGS AND GUARDS

- A. Fabricate railings and guards to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.
 - 1. Rails and Posts: 1-1/2-inch-diameter.
 - 2. Intermediate Rails Infill: 1-1/2-inch-diameter intermediate rails spaced less than 21 inches clear.
- B. Welded Connections: Fabricate railings and guards with welded connections.
 - 1. Fabricate connections that are exposed to weather in a manner that excludes water.
 - a. Provide weep holes where water may accumulate internally.
 - 2. Cope components at connections to provide close fit, or use fittings designed for this purpose.
 - 3. Weld all around at connections, including at fittings.
 - 4. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 5. Obtain fusion without undercut or overlap.
 - 6. Remove flux immediately.
 - 7. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #4 - Good quality, uniform undressed weld with minimal splatter as shown in NAAMM AMP 521.
- C. Form changes in direction of railings and guards as follows:
 - 1. As detailed.
 - 2. By radius bends.
- D. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required.
 - 1. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- E. Close exposed ends of railing and guard members with prefabricated end fittings.
- F. Connect posts to stair framing by direct welding unless otherwise indicated.

2.8 FINISHES

- A. Finish metal stairs after assembly.

- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 - 2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 1. Exterior Stairs: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL STAIRS

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.
 - 1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
 - 1. Grouted Baseplates: Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces.
 - a. Clean bottom surface of baseplates.

- b. Set steel-stair baseplates on wedges, shims, or leveling nuts.
 - c. After stairs have been positioned and aligned, tighten anchor bolts.
 - d. Do not remove wedges or shims, but if protruding, cut off flush with edge of bearing plate before packing with grout.
 - e. Promptly pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
 - 1) Neatly finish exposed surfaces; protect grout and allow to cure.
 - 2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints.
- 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
 - 2. 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.
 - 3. Comply with requirements for welding in "Fabrication, General" Article.

3.3 INSTALLATION OF RAILINGS AND GUARDS

- A. Adjust railing and guard systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.
- 1. Space posts at spacing indicated or, if not indicated, as required by design loads.
 - 2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails and guards so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet.
 - 4. Secure posts, rail ends, and guard ends to building construction as follows:
 - a. Anchor posts to steel by welding to steel supporting members.
 - b. Anchor handrail and guard ends to concrete and masonry with steel round flanges welded to rail and guard ends and anchored with post-installed anchors and bolts.

3.4 REPAIR

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with 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 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 09 91 13 "Exterior Painting"
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION 05 51 19

SECTION 05 52 13 - 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.

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 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters, including finish.
 - 2. Fittings and brackets.

3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of connecting and finishing members at intersections.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- E. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.

1.6 QUALITY ASSURANCE

- A. 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."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.8 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 MANUFACTURERS

- A. Steel woven wire mesh panels and aluminum pipe railings.
 1. Products: Subject to compliance with requirements, provide one of the following manufacturers products:
 - a. Raucci & Sons Ironworks

- b. McGregor Iron Works
- c. Specialty Welding & Fabricators
- d. The Hener Ironworks

B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Railings, including attachment to building construction, 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. applied in any direction.
- b. Concentrated load of 200 lbf applied in any direction.
- c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

- a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
- b. Infill load and other loads need not be assumed to act concurrently.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg. F, ambient; 180 deg. F, material surfaces.

2.3 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.

1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.4 STEEL AND IRON

A. Tubing: ASTM A500 (cold formed) or ASTM A513.

B. Pipe: ASTM A53/A53M, 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 A36/A36M.

2.5 FASTENERS

- A. General: Provide the following:
1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5 for zinc coating.
 2. Aluminum Railings: Type 304 stainless steel fasteners.
- 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.
1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
- C. Fasteners for Interconnecting Railing Components:
1. 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.
 2. Provide tamper-resistant square or hex socket 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 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Section 09 91 23 "Interior Painting".
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Intermediate Coats and Topcoats: Provide products that comply with Section 09 91 23 "Interior Painting."
- E. Epoxy Intermediate Coat: Complying with MPI @72 and compatible with undercoat.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

- G. Nonshrink, Exterior Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- H. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

2.7 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. Shop assemble railings 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 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 are exposed to weather in a manner that excludes 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 either welded or nonwelded 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. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- J. Form Changes in Direction as Follows:
 - 1. As detailed or by inserting prefabricated elbow fittings.

2. By bending.

- K. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. 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 or less.
- N. 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.
- O. 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.

2.8 STEEL AND IRON FINISHES

- A. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." SSPC-SP 3, "Power Tool Cleaning." requirements indicated below:
 - 1. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Railings Indicated to Receive Primers Specified in Section 09 96 00 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Other Railings: SSPC-SP 3, "Power Tool Cleaning."
- C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 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. Shop prime uncoated railings with universal shop primer Section 09 91 23 "Interior Painting" unless indicated.
- D. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.

1. Color: As selected by Architect from manufacturer's full range.

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 are 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 are 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.
 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.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- 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. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler-colored to match finish of railings.
- B. 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.

3.4 ATTACHING RAILINGS

- A. Attach railings to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- 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.

3.5 ADJUSTING AND CLEANING

- A. Clean aluminum by washing thoroughly with clean water and soap and rinsing clean with clean water.
- B. 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 requirements for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 23 "Interior Painting."

3.6 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 05 52 13

SECTION 05 73 00 - DECORATIVE METAL 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. Stainless-steel decorative railings system.

B. Related Sections:

- 1. Section 06 10 00 "Rough Carpentry" for wood blocking for anchoring railings.
- 2. Section 09 22 16 "Non-Structural Metal Framing" for metal backing for anchoring railings.

1.3 DEFINITIONS

- A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas, pedestrian guidance and support, visual separation, or wall protection.

1.4 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. Stainless Steel: 60 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. applied in any direction.
- b. Concentrated load of 200 lbf applied in any direction.
- c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b. Infill load and other loads need not be assumed to act concurrently.
 3. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- D. 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, ambient; 180 deg F, material surfaces.
- E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
1. Manufacturer's product lines of railings assembled from standard components.
 2. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.
- D. Samples for Verification: For each type of exposed finish required.
1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 2. Fittings and brackets.
 3. Welded connections.
 4. Brazed connections.
 5. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.
- E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

- C. Welding certificates.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. 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. Performance characteristics are indicated by criteria subject to verification by one or more methods including structural analysis, preconstruction testing, field testing, and in-service performance.
 - 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.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of railings and are based on the specific system indicated. Refer to Section 01 60 00 "Product 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. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.6, "Structural Welding Code - Stainless Steel."
- E. Preinstallation Conference: Conduct conference at Project site.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 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 suit structural performance requirements.

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. Stainless-Steel Decorative Railings: (Basis of Design)
 - a. HDI Railing Systems - Circum

2.2 MATERIALS FOR GUARDRAILS AND HANDRAIL SYSTEM (CIRCUM)

- A. All rails and other tubular components shall be constructed using the following:

- 1. Stainless steel grade UNS 1.4305, type 304; surface to be 240 grain/grit finish; tubes 1-1/2" outside diameter by 5/64" wall thickness.
- 2. 240 grit finish to match posts and other stainless steel fittings. Transitions from wood to stainless steel either at posts or at bends to be smooth and without burrs.

- B. All posts and other components shall be constructed using the following:

- 1. Stainless steel grad UNS 1.4305, type 304, surface to be 240 grain/grit finish; tubes 1.9" diameter by 0.14" wall thickness.
- 2. Stainless steel grade UNS 1.4305, type 304, surface to be 240 grain/grit finish for end caps at tope of posts. Hardware for handrail attachment to match finish of posts.
- 3. Stainless steel grade UNS 1.4305, type 304, surface to be 240 grain/grit (#6) finish for post fastening base plate.

- C. Fastening bolts to be stainless steel or other high strength material as determined by engineering requirements.

- D. Exterior and aggressive environments require stainless steel grade 316 or 316L to minimize maintenance requirement; surface to be 240 grain/grit (#6) finish.

- E. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus 1/2 of pre-consumer recycled content is not less than 25%.

2.3 STAINLESS STEEL PICKET RAILS

- A. Stainless steel solid vertical picket rails 3/8" supported by upper and lower rails 5/8". Picket rails on approximate 4" centers gaps between pickets and adjacent posts to be equalized depending on required rail length and site conditions (not to exceed 4"). Brushed finish #6 on vertical picket is to be lengthwise (vertically oriented), upper and lower supports to be polished radially. Clamping knobs and fixtures to be stainless steel finished to match.

2.4 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Stainless-Steel Components: Type 304 and Type 316 stainless-steel fasteners per ASTM E 488.
- B. Fasteners for Anchoring 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. Anchors, General: 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.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Low-Emitting Paints and Coatings: Paints and coatings applied to interior decorative metal railings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FABRICATION

- A. Fabricate railing system for compliance with structural requirements of applicable code.
- B. Pre-assemble railings prior to shipping to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and for coordination with shop drawings.
- C. Stainless steel tubing cuts shall be square, without burrs and where exposed, rounded to produce smooth rigid and hairline joints.
- D. Toe Boards: Where indicated, provide stainless steel toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

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 shipment.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. 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.

2.8 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Dull Satin Finish: No. 6.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine 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.
 - 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.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

- D. 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 CLEANING

- A. Clean stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.
- B. 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.

3.4 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.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION 05 73 00

SECTION 05 74 00 - ORNAMENTAL STEEL SCREEN WALL AND GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Ornamental welded steel fencing panels fabricated with galvanized flat bars and round rods welded into modular, open grille fencing panels, including steel fence posts and gates.
- B. Related sections:
 - 1. Section 03 30 00 - Cast-in-Place Concrete: Concrete footings for support of fence posts.

1.2 REFERENCES

- A. ASTM International(ASTM):
 - 1. ASTM A36 – Carbon Structural Steel.
 - 2. ASTM A121 – Metallic-Coated Carbon Steel Barbed Wire.
 - 3. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 4. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 5. ASTM B117 - Operating Salt Spray (Fog) Apparatus.
 - 6. ASTM D822 - Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
 - 7. ASTM D2794 - Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
 - 8. ASTM D3363 - Test Method for Film Hardness by Pencil Test.

1.3 SUBMITTALS

- A. Provide in accordance with Section 01 33 00 - Submittal Procedures:
 - 1. Product data for components and accessories.
 - 2. Shop drawings showing layout, dimensions, spacing of components, [interface with electric gate operator,] and anchorage and installation details.
 - 3. Sample: 8 by 10 inches minimum size sample of fence panel illustrating design, fabrication workmanship, and selected color coating.
 - 4. Copy of warranty specified in Paragraph 1.4 for review by Architect.

1.4 WARRANTY

- A. Provide in accordance with Section 01 77 00 - Closeout Procedures:
 - 1. Factory finish: 20-year warranty against cracking, peeling, and blistering under normal use.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Basis of Design: Ametco Manufacturing Corporation, 4326 Hamann Parkway, P.O. Box 1210, Willoughby, Ohio 44096; 800-362-1360.
- B. Product: Shadow 100 Fixed Louver Screen Wall
- C. Manufacturers of equivalent products submitted and approved in accordance with Section 01 25 13 - Product Substitution Procedures.

2.2 MATERIALS

- A. Steel bar stock: ASTM A36.
- B. Steel tubing: ASTM A500, Grade B.
- C. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, and water-reducing and plasticizing additives.

2.3 FENCE SYSTEM

- A. Type: Ornamental steel fencing system consisting of modular open grille fencing panels fabricated by welding flat steel bars and rods, supported by steel posts and gates and gate hardware; Ametco Fence System as manufactured by Ametco Manufacturing Corporation.
- B. Fence panels: Fabricated from galvanized steel rods, flat bars, [round tube and louvers] welded to form an open grille pattern; Shadow 100 as manufactured by Ametco Manufacturing Corporation.
 - 1. Shadow 100 fixed louver screenwall Horizontal fixed louver bars: Formed louver shaped bars, 1-31/32 by 1/16 inch, spaced at 1-13/16 inch. Extend louver flange to allow 100 percent direct visual screening.
 - 2. Cross rods: 5/32 inch diameter rods welded perpendicular to back side of louver bars and spaced at 5-7/32 inches.
 - 3. Perimeter side support bars: 2 by 1/4 inch flat bars.
 - 4. Panel height: Refer to drawings.
 - 5. Panel width: 64-21/32 inches.
- A. Posts: Galvanized square steel tubes.
 - 1. Size: See drawings.
 - 2. Length: See drawings.
 - 3. Weld flat steel bar top caps to tubular posts.

2.4 GATES

- A. Provide gates of type and size indicated on Drawings. Equip gates with manufacturer's standard hardware as required for complete functional operation.
- B. Type: Hinged swinging double gate. See drawings.
 - 1. Construction: Welded frame fabricated from steel tubing with open grille steel panels to match fencing material.
 - 2. Nominal size: See drawings.
 - 3. Hardware:
 - a. Hinges: Size and type as determined by manufacturer. Provide 2 hinges for each leaf up to 6 feet high and 1 additional hinge for each additional 24 inches in height or fraction thereof.
 - b. Latch: 3/4 inch diameter slide bolt to accommodate padlock.
 - c. For double gates provide pad lockable, 5/8 inch diameter center cane bolt assembly and strike.

2.5 FACTORY FINISH

- A. Steel fence panels and posts shall be hot-dip galvanized to 1.25 ounces per square foot minimum zinc coating in accordance with ASTM A123. Standard size components shall receive polyester powder coating. Large gate panels shall be coated with 2-part polyurethane coating.
- B. Polyester powder coating: Electrostatically applied colored polyester powder coating heat cured to chemically bond finish to metal substrate.
 - 1. Minimum hardness measured in accordance with ASTM D3363: 2H.
 - 2. Direct impact resistance tested in accordance with ASTM D2794: Withstand 160 inch-pounds.
 - 3. Salt spray resistance tested in accordance with ASTM B117: No undercutting, rusting, or blistering after 500 hours in 5 percent salt spray at 95 degrees F and 95 percent relative humidity and after 1000 hours less than [3/16 inch] [5 mm] undercutting.
 - 4. Weatherability tested in accordance with ASTM D822: No film failure and 88 percent gloss retention after 1 year exposure in South Florida with test panels tilted at 45 degrees.

PART 3 - PREPARATION

- A. Prior to fabrication, field verify required dimensions.
- B. Cast concrete footings in accordance with Section 03 30 00 - Cast-in-Place Concrete as detailed on Drawings and approved shop drawings.
 - 1. See drawings for foundation detail.

3.2 INSTALLATION

- A. Install fencing in accordance with manufacturer's installation instructions and approved shop drawings.
- B. Install fence posts plumb and level by setting post in hole cast, drilled in concrete and grouting solid; by embedding post directly in concrete footing. Temporarily brace fence posts with 2 by 4 wood supports until concrete, grout is set.
- C. Do not install bent, bowed, or otherwise damaged panels. Remove damaged components from site and replace.
- D. Secure fence panels with standard stainless steel bolts, stainless steel anti-intruder bolts to fence posts prior to setting posts in footings; after posts have been set in footings.
- E. Gates:
 - 1. Install gates and adjust hardware for smooth operation.
 - 2. Provide concrete center foundation depth and drop rod retainers at center of double swinging gate openings.
 - 3. Provide concrete surface for length of operation of V-wheeled rolling gate. Anchor track to concrete with countersunk fasteners.
 - 4. After installation, test gate and operator. Open and close a minimum of five times. Correct deficiencies and adjust.
- F. Touch-up damaged finish with paint supplied by manufacturer and matching original coating.

END OF SECTION 05 74 00

SECTION 06 10 00 - 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. Wood blocking and nailers.
 - 3. Wood furring.
 - 4. Plywood backing panels.
- B. Related Requirements:
 - 1. Section 06 16 00 "Sheathing."

1.3 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. SPIB: The Southern Pine Inspection Bureau.
 - 4. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

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

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
 1. Wood-preservative-treated wood.
 2. Fire-retardant-treated wood.
 3. Power-driven fasteners.
 4. Powder-actuated fasteners.
 5. Expansion anchors.
 6. Metal framing anchors.

1.6 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.

1.7 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. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship" for the following:
 - 1. Dimension lumber framing.
 - 2. Rim boards.
 - 3. Miscellaneous lumber.
- B. 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. 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.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.
- C. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER (At Roof Blocking)

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC3b for exterior 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. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood 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, furring 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 floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS (Interior Wood Framing)

- 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 beyond the centerline of the burners at any time during the test.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. 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.
 - 3. 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. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat all rough carpentry at interior training platform
 - 1. Framing for raised platforms.
 - 2. Framing for non-load-bearing partitions.
 - 3. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

- A. Interior Wood Framing indicated.
 - 1. Species:
 - a. Spruce-pine-fir; NLGA.
- B. Other Framing Not Listed Above: Any species of machine stress-rated dimension lumber with a grade of not less than 2400f-2.0E.

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.
 3. Furring.
- B. For items of dimension lumber size, provide No. 2 grade lumber of any species.
- C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
1. Spruce-pine-fir No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 2. Northern species; No. 2 Common grade; NLGA.
- D. 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.
- E. 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.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

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 3/4-inch 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 rough 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. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete

as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.8 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, that may be incorporated into the Work include, but are not limited to, the following:
 1. Cleveland Steel Specialty Co.
 2. Simpson Strong-Tie Co., Inc.
 3. USP Structural Connectors.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 1. Use for interior locations unless otherwise indicated.
- D. 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 coating designation; and not less than 0.036 inch thick.
 1. Use for wood-preserved-treated lumber and where indicated.

2.9 MISCELLANEOUS MATERIALS

- A. Adhesives for Gluing, Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- D. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
- 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.
- H. 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.
- I. Securely attach rough 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.
- J. 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.
- K. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 - 1. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches 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 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.4 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 rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

SECTION 06 16 00 - 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. This Section includes the following:
 - 1. Wall sheathing
 - 2. Air Water Vapor Barrier.
 - 3. Flexible flashing at openings in sheathing.
- B. Related Sections include the following:
 - 1. Division 06 Section "Rough Carpentry" plywood backing panels.

1.3 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. For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 - 1. Building wrap

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WALL SHEATHING

- A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.

1. Product:
 - a. G.P. Gypsum Corporation – “Dens-Glass Gold
 - b. National Gypsum – EXP Sheathing
2. Type and Thickness: Regular, 1/2 inch thick.
3. Size: 48 by 96 inches for vertical installation.

2.2 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 1. For 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 board 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 thick, attach sheathing to comply with ASTM C 1002.
 2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

2.3 AIR WATER VAPOR BARRIER

- A. Carlisle CCW-705 – Refer to specification section 072713.
- B. Fire retardant composition permits use in many wall assemblies requiring NFPA 285.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing Board: 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.

- B. Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.

2.5 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Plus Self-Adhered Flashing.
- C. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

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.
- 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 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's "Uniform Building Code."
- 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 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 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 gap where non-load-bearing construction abuts structural elements.
 - 3. Install boards with a 1/4-inch 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 boards but do not cut into facing.
- C. 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 o.c. and set back a minimum of 3/8 inch 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.

3.3 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturers written instructions.
 - 1. Prime substrates as recommended by flashing manufacturer.
 - 2. Lap seams and junctures with other materials at least 4 inches, except that at flashing flanges of other construction, laps need not exceed flange width.
 - 3. Lap flashing over weather-resistant building paper at bottom and sides of openings.
 - 4. Lap weather-resistant building paper 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 06 16 00

SECTION 06 16 01 - WOOD SHEATHING (AT STAGE)

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. Plywood Subflooring at stage floor.
- 2. Tempered Hardboard at stage floor.

- B. Related Requirements:

- 1. Section 06 10 00 "Rough Carpentry".

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

- 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
- 2. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5516.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:

- 1. Fire-retardant-treated plywood.

- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications:

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

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

2.3 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 1. Use treatment that does not promote corrosion of metal fasteners.
 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.

3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D5516 and design value adjustment factors shall be calculated according to ASTM D6305. Span ratings after treatment shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat plywood indicated on Drawings, and the following:
 1. Subflooring and underlayment for raised platforms.

2.4 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Subflooring: DOC PS 2-92, Exposure 1 single-floor panels or sheathing.
 1. Span Rating: Not less than 48/24.
 2. Nominal Thickness: Not less than 23/32 inch.
- B. Tempered Hardboard: Provide tempered hardboard in 1/4" nominal thicknesses indicated or over smooth subfloors.
 1. Duron 1/4" double tempered hardboard or 1/4" HDF S2S double tempered hardboard.
 - a. Woodcraft Mfg. Co. Dayton Kentucky, Attn: JR Graham (859) 581-2227.
 2. Provide 10 panels attic stock.
 3. Paint all sides with (2) coats Rosco Tough Prime. (eggshell finish)
 4. Install in running bond pattern.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture. (Review preferred anchoring of tempered hardboard with Owner).
- B. Nails: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

2.6 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01, ASTM D3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
- 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.

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. Subflooring:
 - a. Glue and nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/4 inch apart at edges and ends.

3.3 HARDBOARD INSTALLATION

- A. Comply with CPA's recommendations and hardboard manufacturer's written instructions for preparing and applying hardboard underlayment.
 - 1. Fastening Method: install deck screws or drywall screws at 12" o.c. at perimeter countersunk (coordinate fastening with the owner).

END OF SECTION 06 16 01

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

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. Wood Products
2. Plastic-laminate cabinets.
3. Plastic-laminate countertops.
4. Solid surface countertops.
5. Monarch Metal Inc.- easy panel system

- B. Related Sections include the following:

1. Division 06 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 ENVIRONMENTAL

- A. Composite wood and agrifiber products must contain no urea-formaldehyde resins.
- B. Laminating adhesives used off and on site must contain no urea-formaldehyde.
- C. All adhesives must comply with the VOC Requirements of SCAQMD Rule 1168.
 1. Wood Adhesives: Max 30g/L VOC
 2. Content Adhesives: max 80g/L VOC.

1.5 SUBMITTALS

- A. Product Data: For high-pressure decorative laminate, adhesive for bonding plastic laminate, cabinet hardware and accessories.

- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for and other items installed in architectural woodwork.
- C. Samples for Verification:
 - 1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
 - 2. Solid surfacing materials, 6 inches square for each type, color, pattern and surface finish.
 - 3. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
 - 4. Exposed cabinet hardware and accessories, one unit for each type and finish.
- D. Product Certificates: For each type of product, signed by product manufacturer.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Certified participant in AWI's Quality Certification Program.
- B. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Provide AWI Quality Certification Program certificates indicating that woodwork, including installation, complies with requirements of grades specified.
- C. 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. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg. F and relative humidity between 25 and 55 percent during the remainder of the construction period.

- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.
 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Products: Comply with the following:
1. Hardboard: AHA A135.4.
 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD.
 3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
 4. Softwood Plywood: DOC PS 1, Medium Density Overlay.
 5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.
- C. Thermoset Decorative Panels: Medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
1. Provide PVC edge banding complying with LMA EDG-1 on components with exposed or semi-exposed edges, thicknesses as designated on the Construction Documents.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:

- a. Wilsonart International Inc.
 - b. Formica Corporation.
 - c. Nevamar
- E. Solid Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with OSSFA-2.
- 1. Manufacturer: Subject to compliance with requirements indicated on construction drawings, provide products by one of the following:
 - a. Dupont – “Corian” as designated at the Finish Legend.
 - 2. Type: Standard type, unless Special Purpose type is indicated on construction drawings.

2.2 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials as per schedule on the drawings associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.
- C. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- D. Drawer Slides: BHMA A156.9, B05091.
 - 1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-overtravel-extension type; zinc-plated steel ball-bearing slides.
 - 2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
- E. Door Locks: BHMA A156.11, E07121. (Must accommodate best lock Small Format Interchangeable Core (SFIC) Keyed into existing campus wide Key System.) Cores provided through Division 08 Supplier.
- F. Drawer Locks: BHMA A156.11, E07041. (Must accommodate best lock Small Format Interchangeable Core (SFIC) Keyed into existing campus wide Key System.) Cores provided through Division 08 Supplier.
- G. Grommets for Cable Passage through Countertops: Refer to the Drawings for model number.
- H. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.
- I. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- C. Adhesive for Bonding Plastic Laminate: Contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.4 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
 - 3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.
- D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.

2.5 PLASTIC-LAMINATE CABINETS

- A. AWI Type of Cabinet Construction: Flush overlay.
- B. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces including Tops & Underside of wall cabinets: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS.
 - 4. All edges of Doors, Drawers, Shelves and Frame Faces shall be 3mm PVC.
- C. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
 - a. All edges of Doors, Drawers, Shelves and Frame Faces shall be 3mm PVC.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber.
 - 3. Drawer Bottoms: Hardwood plywood.
- D. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
- E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated in the Construction Drawings.
- F. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.
- G. When a Wood Grain Laminate or Linear-Type patterned laminate is used: Door and Drawer patterns shall be installed in the same direction. Refer to the Millwork elevations for installation direction.

2.6 PLASTIC-LAMINATE COUNTERTOPS

- A. High-Pressure Decorative Laminate Grade: HGS.
- B. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated in the Construction Drawings.
- C. Edge Treatment: 3mm PVC unless otherwise noted.
- D. Core Material: Medium density fiberboard (formaldehyde free).
- E. Core Material at Sinks: Exterior-grade plywood.

- F. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.
- G. Paper Backing: Provide paper backing on underside of countertop substrate.
- H. Structural (ANSI/AWI 1239-2022 – Countertops)
 - 1. Countertops shall be constructed to resist a 50 lbs. per 144 sq. ft. load and not deflect in excess of .250” in any direction. Countertop shall not crack nor be permanently deformed under this load.
 - 2. Load values expressed within this standard do not suggest service loads nor shall they be constructed as suggesting normal countertop usage loads.
 - 3. Fittings and fixtures installed in a factory setting shall be mounted in accordance with manufacturer/supplier’s documented instructions.
 - 4. Cut-outs within a countertop shall be made by either manufacturer/supplier or installer. Sink cut-outs shall not fall within 18” of a joint.

2.7 SOLID SURFACING COUNTERTOPS

- A. Solid-Surfacing-Material Thickness: 1 /2 inch.
- B. Colors, Patterns and Finishes: Provide materials and products that result in color of solid-surfacing material complying with the following requirements:
 - 1. As indicated on the Construction Drawings.
- C. Fabricate cap in one piece, unless otherwise indicated. Comply with solid-surfacing material manufacturer’s written recommendations for adhesives, sealers, fabrication and finishing.
 - 1. Fabricate with shop applied edges of materials and configuration indicated.
- D. Structural (ANSI/AWI 1239-2022 – Countertops)
 - 1. Countertops shall be constructed to resist a 50 lbs. per 144 sq. ft. load and not deflect in excess of .250” in any direction. Countertop shall not crack nor be permanently deformed under this load.
 - 2. Load values expressed within this standard do not suggest service loads nor shall they be constructed as suggesting normal countertop usage loads.
 - 3. Fittings and fixtures installed in a factory setting shall be mounted in accordance with manufacturer/supplier’s documented instructions.
 - 4. Cut-outs within a countertop shall be made by either manufacturer/supplier or installer. Sink cut-outs shall not fall within 18” of a joint.

2.8 MONARCH METAL INC. – EASY PANEL SYSTEM

A. Class A wood veneer panel

Manufacturer: Monarch Metal Inc.
Style: 1/4" Class A / Prefinished Quarter Cut
Color: 6129AN "White Oak"
Finish: Satin
Contact: 1700 Ocean Avenue, Suite 2, Ronkonkoma, NY 11779
(631) 856-2993

Note: Class A Panels require fabrication time. Verify with Distributor and allow for lead time.

2.9 SHOP FINISHING

- A. Grade: Provide finishes of same grades as items to be finished.
- B. General: Finish architectural woodwork at fabrication shop as noted on Construction Drawings.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 - 3. Caulk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants".
- H. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 40 23

SECTION 07 13 25 - SELF-ADHERING SHEET WATERPROOFING (BITUTHENE)

PART 1 - GENERAL

1.1 SUMMARY

- A. The work of this section includes, but is not limited to, the following:
 - 1. Rubberized asphalt sheet membrane waterproofing.
 - 2. Prefabricated drainage composite.
 - 3. Protection board.
- B. Related Sections: Other specification sections which directly relate to the work of this section include, but are not limited to, the following:
 - 1. Section 03 30 00 – Cast-In-Place Concrete
 - 2. Section 04 20 00 – Unit Masonry
 - 3. Section 07 60 00 – Flashing and Sheet Metal
 - 4. Section 07 92 00 – Joint Sealants
 - 5. Section 07 95 00 – Expansion Control
 - 6. Section 33 46 00 – Subdrainage

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations. Include certification of data indicating VOC (Volatile Organic Compound) content of all components of waterproofing system.
- B. Samples: Submit representative samples of the following for approval:
 - 1. Sheet membrane.
 - 2. Protection board.
 - 3. Prefabricated drainage composite.

1.3 REFERENCE STANDARDS

- A. The following standards and publications are applicable to the extent referenced in the text.
- B. American Society for Testing and Materials (ASTM)
 - 1. C 836 Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
 - 2. D 412 Standard Test Methods for Rubber Properties in Tension
 - 3. D 570 Standard Test Method for Water Absorption of Plastics
 - 4. D 882 Standard Test Methods for Tensile Properties of Thin Plastic Sheeting
 - 5. D 903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
 - 6. D 1876 Standard Test Method for Peel Release of Adhesives (T-Peel)

7. D 1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
8. D 3767 Standard Practice for Rubber - Measurements of Dimensions
9. D 5385 Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
10. E 96 Standard Test Methods for Water Vapor Transmission of Materials
11. E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

1.4 QUALITY ASSURANCE

- A. **Manufacturer:** Sheet membrane waterproofing shall be manufactured and marketed by a firm with a minimum of 20 years' experience in the production and sales of self-adhesive sheet membrane waterproofing. Manufacturers proposed for use but not named in these specifications shall submit evidence of ability to meet all requirements specified and include a list of projects of similar design and complexity completed within the past 5 years.
- B. **Installer:** A firm which has at least 3 years' experience in work of the type required by this section.
- C. **Materials:** For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.
- D. **Pre-Installation Conference:** A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of it in accordance with applicable regulations.
 1. Do not double-stack pallets of membrane on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
- B. Sequence deliveries to avoid delays but minimize on-site storage.
- C. **Safety and Handling:** Users must read and understand the product label and Safety Data Sheets (SDS's) for each system component before use. All users must acquaint themselves with this information prior to working with the material. Carefully read detailed precaution statements on the product labels and SDS's before use.

1.6 PROJECT CONDITIONS

- A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.

- B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

1.7 WARRANTY

- A. Sheet Membrane Waterproofing: Provide written 5 year material warranty issued by the membrane manufacturer upon completion of the work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Sheet Membrane Waterproofing: BITUTHENE® 3000 Membrane/Low Temperature Membrane as manufactured by GCP Applied Technologies; a self-adhesive, cold-applied composite sheet consisting of a thickness of (0.056 in.) of rubberized asphalt and (0.004 in.) of cross-laminated, high density polyethylene film. Provide rubberized asphalt membrane covered with a release sheet, which is removed during installation and no special adhesive or heat shall be required to form laps. Provide membrane with the following physical properties:

PHYSICAL PROPERTIES: BITUTHENE® 3000 Membrane & BITUTHENE® LOW TEMPERATURE Membrane

Property	Test Method	Typical Value
Color		Dark gray-black
Thickness	ASTM D 3767 Method A	1.5 mm (0.060 in.) nominal
Flexibility, 180° bend over 25 mm (1 in.) mandrel at -32°C (-25°F)	ASTM D 1970	Unaffected
Tensile Strength, Membrane Die C	ASTM D 412 ¹	2240 kPa (325 psi) minimum
Tensile Strength, Film	ASTM D 882 ¹	34.5 MPa (5,000 psi) minimum
Elongation, Ultimate Failure of Rubberized Asphalt	ASTM D 412 ¹	300% minimum
Crack Cycling at -32°C (-25°F), 100 Cycles	ASTM C 836	Unaffected
Lap Shear	ASTM D 1002 ²	89 N (20 lbs) minimum
Peel Strength	ASTM D 903	1576 N/m (9 lbs/in.) minimum
Puncture Resistance, Membrane	ASTM E 154	222 N (50 lbs) minimum
Resistance to Hydrostatic Head	ASTM D 5385	>70 m (>230 ft) of water
Permeance	ASTM E 96, Section 12 – Water Method	<0.1 perms
Water Absorption	ASTM D 570	0.1% maximum

Footnotes:

1. The test is run at a rate of 2 inches per minute.
2. The test is run at a rate of 4 inches per minute.

2.2 ANCILLARY PRODUCTS (Reference gcpat.com for complete technical details)

- A. Prefabricated Drainage Composite: HYDRODUCT® 220 and/or HYDRODUCT® 660 Drainage Composite as manufactured by GCP Applied Technologies to promote positive drainage while serving as a protection course.
- B. Protection Board:
 - 1. Expanded Polystyrene Protection Board: 1 in. thick for vertical applications with the following characteristics. Adhere to waterproofing membrane with BITUTHENE® Protection Board Adhesive.
 - a. Normal Density: 1.0 lb/ft³
 - b. Thermal Conductivity, K factor: 0.24 at 40°F, 0.26 at 75°F
 - c. Thermal Resistance, R-Value: 4 per 1 in. of thickness.
 - 2. Asphalt Hardboard: A premolded semi-rigid protection board consisting of bitumen, mineral core and reinforcement. Provide 0.125 in. thick hardboard on horizontal surfaces not receiving steel reinforced slab. Where steel reinforcing bars are to be used, apply two layers of 0.125 in. thick hardboard or one layer of 0.25 in. thick hardboard.
- C. Waterstop: Adcor™ hydrophilic waterstop as manufactured by GCP Applied Technologies for non-moving concrete construction joints.
- D. Miscellaneous Materials: Surface conditioner, mastic, liquid membrane, tape and accessories specified or acceptable to manufacturer of sheet membrane waterproofing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 SUBSTRATE PREPARATION

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing.
- B. Cast-In-Place Concrete Substrates:
 - 1. Do not proceed with installation until concrete has properly cured and dried (minimum 7 days for normal structural concrete and minimum 14 days for lightweight structural concrete).
 - 2. Fill form tie rod holes with concrete and finish flush with surrounding surface.
 - 3. Repair bugholes over 0.5 in. in length and 0.25 in. deep and finish flush with surrounding surface.
 - 4. Remove scaling to sound, unaffected concrete and repair exposed area.

5. Grind irregular construction joints to suitable flush surface.
- C. Masonry Substrates: Apply waterproofing over concrete block and brick with smooth trowel-cut mortar joints or parge coat.
- D. Wood Substrates: Apply waterproofing membrane over securely fastened sound surface. All joints and fasteners shall be flush to create a smooth surface.
- E. Related Materials: Treat joints and install flashing as recommended by waterproofing manufacturer.

3.3 INSTALLATION

- A. Refer to manufacturer's literature for recommendations on installation, including but not limited to, the following:
 1. Apply primer at rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of primer.
 2. Delay application of membrane until primer is completely dry. Dry time will vary with weather conditions.
 3. Seal daily terminations with troweled bead of mastic.
 4. Apply protection board and related materials in accordance with manufacturer's recommendations.

3.4 CLEANING AND PROTECTION

- A. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.
- B. Inspect for damage just prior to installation of subsequent construction activities and make repairs in accordance with manufacturer's recommendation.

END OF SECTION 07 13 25

SECTION 07 21 00 - 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. Mineral-wool board insulation.
3. Glass-fiber sound attenuation blanket insulation.
4. Mineral-wool blanket insulation.
5. Foil faced mineral wool blanket insulation.

B. Related Sections:

1. Section 07 84 46 "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. Perimeter Foundation Insulation 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. Dow Chemical Company
 - b. Owens Corning
 - 2. Type IV, 25 psi.
- B. Cavity Wall Insulation Polyisocyanurate Board, Foil Faced: ASTM C289, foil faced, Type I, Class 2.
 - 1. R Max Ecomaxci FR Air Barrier with R-Seal 2000 LF Liquid Flashing and R-Seal 6000 Tape at windows and doors.
 - 2. Dow Chemical Company – Dow Thermax XArmor with Dow Liquid Armor.
 - 3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.2 MINERAL-WOOL BOARD 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. Thermafiber
 - 2. Isolatek International.
 - 3. Owens Corning.

4. Roxul Inc.
5. Fibrex Insulations Inc.

B. Unfaced, Mineral-Wool Board Insulation: ASTM C 612; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Nominal density of 6 lb/cu. ft., Type II, thermal resistivity of 4.16 deg F x h x sq. ft./Btu x in. at 75 deg F.

2.3 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.
3. Owens Corning.

B. Unfaced, Glass-Fiber (Sound Attenuation) 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.

2.4 MINERAL-WOOL 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. Thermafiber
2. Owens Corning
3. Fibrex Insulations Inc.
4. Roxul Inc.

B. Mineral-Wool Blanket, Reinforced-Foil Faced (at exterior walls): ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less per ASTM E 84); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

C. 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.

2.5 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, available products that may be incorporated into the Work include, but are not limited to, 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 thick by 2 inches square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.
- B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle 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, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Gemco; 90-Degree Insulation Hangers.
 2. Angle: Formed from 0.030-inch- thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.
- C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
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. AGM Industries, Inc.; RC150.
 - b. Gemco; Dome-Cap.
 2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
 - a. Ceiling plenums.
 - b. Where indicated.
- D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch between face of insulation and substrate to which anchor is attached.
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. Gemco; Clutch Clip.
- E. 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, available products that may be incorporated into the Work include, but are not limited to, 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 vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications 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 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 below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation

between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 04 20 00 "Unit Masonry".

3.5 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 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, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
 5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward interior of construction.
 - b. Interior Walls: Set units with facing placed toward areas of high humidity.
- D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

3.6 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

- A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partitions.

3.7 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

- A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
 - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
 - 2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
 - 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
 - 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.8 INSTALLATION OF CURTAIN-WALL INSULATION

- A. Install board insulation in curtain-wall construction where indicated on Drawings according to 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.

3.9 PROTECTION

- A. Protect installed insulation and vapor retarders 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 07 21 00

SECTION 07 27 13 - MODIFIED BITUMINOUS SHEET AIR BARRIERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. A self-adhering membrane air & vapor barrier and accessory products by Carlisle Coatings & Waterproofing (Basis of Design: CCW-705)
- B. Materials and installation for an air & vapor barrier assembly within exterior wall assemblies as indicated on drawings
- C. Materials and installation to bridge and seal the following air leakage pathways and gaps:
 - 1. Connections of the walls to the roof air barrier
 - 2. Connections of the walls to the foundations
 - 3. Openings and penetrations of window frames, door frames, store front, curtain wall
 - 4. Door frames Piping, conduit, duct and similar penetrations
 - 5. Masonry ties, screws, bolts and similar penetrations
 - 6. All other air leakage pathways through the opaque walls

1.2 PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION:

Flexible through-wall flashings to be built into masonry are furnished under Section 07 65 26 – Self-Adhering Through-Wall Flashing or Section 07 65 23 – EPDM Through-Wall Flashing.

1.3 RELATED SECTIONS

- A. Section 03 30 00 - Cast-In-Place Concrete [Require that backup concrete be free of fins, protrusions and large holes]
- B. Section 04 20 00 - Unit Masonry [When concrete masonry unit (CMU) block walls are to receive Air & Vapor Barrier materials it is critical to address surface preparation issues in this section. Due to the method of installation of the CMU, generally from the inside out, the most critical surfaces to receive the Air & Vapor Barrier materials are neglected and not tooled properly. It is strongly suggested to cut and paste text located in PART 3 – EXECUTION, Article 3.02, Paragraph A of Section 07 27 13 into Section 04 20 00. The masonry trade must be made aware that this is a critical element for the self-adhering Air & Vapor Barrier material. The performance of the Air & Vapor Barrier material is directly related to the substrate OVER WHICH IT WILL be applied.]
- C. Section 07 13 25 - Sheet Waterproofing
- D. Section 07 21 00 - Thermal Insulation
- E. Section 07 53 00 – Elastomeric Membrane Roofing

- F. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal through- wall flashings
- G. Section 07 92 00 - Joint Protection: Joint sealant materials and installation.
- H. Section 08 41 00 – Aluminum Framed Entrance and Storefronts
- I. Section 08 44 13 – Glazed Aluminum Curtain Wall
- J. Section 06 16 00 – Sheathing

1.4 REFERENCES

- A. ASTM C 920 Standard Specification for Elastomeric Joint Sealants
- B. ASTM D 146 Standard Test Methods for Sampling and Testing Bitumen Saturated Felts and Woven Fabrics for Roofing and Waterproofing
- C. ASTM D 412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
- D. ASTM D 570 Standard Test Method for Water Absorption of Plastics
- E. ASTM D 903 Standard Test Method for Peel and Stripping Strength of Adhesive Bonds
- F. ASTM D 1876 Standard Test Method for Peel Resistance of Adhesive
- G. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials.
- H. ASTM E 154 Standard Test Methods for Water Vapor Retarders used in Contact with Earth under Concrete Slabs, on Walls or as Ground Cover
- I. ASTM E 283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors under Specified Pressure Differences across the Specimen
- J. ASTM E 330 Standard Test Method for the Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Pressure Difference
- K. ASTM E 331 Standard Test Method for Water Penetration of Exterior Windows, Doors, and Curtain Walls by Uniform Static Air Pressure
- L. ASTM E 783 Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
- M. ASTM E 1105 Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference
- N. ASTM E 2178 Standard Test Method for Air Permeance of Building Materials

1.5 PERFORMANCE REQUIREMENTS

- A. Installed Product and Accessories constitute an air barrier assembly, which shall be air-tight, durable and continuous, as described in Commonwealth of Massachusetts Building Code requirements: 780 CMR Chapter 13, Paragraphs 1304.3.1 Air Barriers and 1304.3.2 Air Barrier Penetrations.
- B. Installed Product and Accessories shall exhibit no visible water leakage when tested per ASTM E 331 and shall perform as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration.
- C. Installed Product and Accessories shall exhibit an air leakage rate not exceeding 0.02 L/s*m² at 75 Pa (0.004 CFM/ft² at 1.57 PSF) according to ASTM E 283. Air leakage shall not exceed this rate while Product and Accessories remain soundly adhered after exposure to sustained and gust wind loading according to ASTM E 330.
- D. Installed Product and Accessories shall perform as a vapor barrier, installed on the predominantly warm side of the insulation.
- E. Product shall consist of nominal 0.040 inch (40 mils) thickness membrane consisting of smooth surfaced, cross-laminated high- density polyethylene (HDPE) film fully-coated with rubberized asphalt adhesive. Film shall be legibly imprinted with manufacturer’s brand name, logo and contact information. Membrane shall be provided in rolls of various widths interleaved with disposable silicone release paper.
- F. Product shall meet the following requirements:

REQUIREMENT	RESULT	TEST METHOD
Air Permeance	Not more than 0.000 Liters per second per square meter of area at 75 Pa pressure differential	ASTM E-2178
Tensile Strength	Not less than 500 psi	ASTM D-412
Tensile Elongation	Not less than 1,000 percent	ASTM D-412
Puncture Resistance	Not less than 50 lb.	ASTM E 154
Low Temperature Flexibility	Unaffected at minus 25 degrees F, 0.063 inch mandrel	ASTM D 146
Peel Adhesion	Not less than 5 lb per inch of width on concrete prepared with contact adhesive	ASTM D 903
Lap Adhesion	Not less than 7.5 lb. per inch of width	ASTM D 1876
Water Vapor Permeance	Not more than 0.05 Perm	ASTM E-96, Method B
Water Absorption	Not more than 0.12 percent by weight	ASTM D 570

1.6 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00

- B. At bid submission, provide evidence to the Architect of installer qualification by the air & vapor barrier manufacturer.
- C. Provide evidence of evaluation of Product by the Air Barrier Association of America (ABAA).
- D. At bid submission, provide evidence of licensing and certification under the ABAA Quality Assurance Program.
- E. Shop drawings showing locations and extent of air & vapor barrier and details of all typical conditions.
- F. Manufacturer's technical data sheets and material safety data sheets for Product and Accessories.
- G. Manufacturer's installation instructions.
- H. Manufacturer's documentation of volatile organic compounds (VOC) content for Product and Accessories.
- I. Certification of compatibility by Manufacturer, listing all materials on the project with which the Product and Accessories may come into contact.
- J. Sample of Product minimum 3 inch by 4 inch size.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Shall be experienced in applying the same or similar materials and shall be specifically approved in writing by Manufacturer.
 - 2. Shall be licensed and certified to install Self-Adhering Sheet Membrane Air Barriers by the Air Barrier Association of America (ABAA)
- B. Single-Source Responsibility: Obtain Product and Accessories from single manufacturer.
- C. Product and Accessories shall comply with all state and local regulations controlling use of volatile organic compounds (VOCs).
- D. Comply with the provisions of the Owner's Building Envelope Commissioning program in accordance with Section 01 91 15.
- E. Pre-Installation Meeting: Convene one week prior to commencing Work of this section, in accordance with Section 01 31 19 - Project Meetings.
- F. Field-Constructed Mock-Ups: Prior to installation on Project, apply Product and Accessories on mock-up to verify details under shop drawing submittals, to demonstrate tie-ins with adjoining construction and other termination conditions and to become familiar with properties of materials in application:
 - 1. Apply in field-constructed mockups of assemblies as specified in Section 01 43 39 – Mockups

2. Construct typical exterior wall panel, 8 feet long by 8 feet wide, incorporating back-up wall, cladding, window and doorframe and sill, insulation, flashing, [building corner condition,] [junction with roof system] [foundation wall] [and] [typical penetrations and gaps]; illustrating interface of materials and seals

- G. Test mock-up in accordance with Section 01 43 00 – Quality Assurance and test in accordance with ASTM E 783 and ASTM E1105 for air and water infiltration
- H. Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover any installed Product unless it has been inspected, tested and approved.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, lot number and directions for storage.
- B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by Manufacturer.
- C. Avoid spillage. Immediately notify Owner, [Architect] [Consultant] if spillage occurs and start clean up procedures. Clean spills and leave area as it was prior to spill.

1.9 WASTE MANAGEMENT AND DISPOSAL

- A. Place materials defined as hazardous or toxic waste in designated containers.
- B. Ensure emptied containers are stored safely for disposal away from children.

1.10 PROJECT CONDITIONS

- A. Do not apply Product or Accessories during rain or accumulating snowfall.
- B. Apply Product and Accessories within approved ambient and substrate temperature range stated in Manufacturer's literature.
- C. Do not apply Product or Accessories over incompatible materials.
- D. Observe safety and environmental measures indicated in Manufacturer's MSDS, and mandated by federal, state and local regulations.

- 1.11 WARRANTIES: Provide the Manufacturer's minimum five year material warranty under provisions of Section 01 78 36 – Warranties.

PART 2 - PRODUCTS

- 2.1 PRODUCTS: Provide as manufactured by Carlisle Coatings & Waterproofing, Incorporated. 900 Hensley Lane, Wylie, TX 75098. Phone 1-800-527-7092. Website <http://www.carlisle-ccw.com> ;
- A. Standard: CCW-705 Air & Vapor Barrier
 - B. Low-Temp: CCW-705 LT Air & Vapor Barrier
- 2.2 ACCESSORIES: Provide as manufactured by Carlisle Coatings & Waterproofing, Incorporated.
- A. Detail Membrane: 40 mil thickness self-adhering flashing provided in rolls of various widths, select either:
 - 1. CCW-705 Air & Vapor Barrier Strips
 - 2. CCW-705 LT Air & Vapor Barrier Strips
 - B. Contact Adhesive, select any:
 - 1. CCW-702 or CCW-702 LV Solvent-Based
 - 2. CCW-702 WB Water-Based
 - 3. CAV-GRIP™ Aerosol Spray
 - C. Mastic, select either:
 - 1. LM 800 XL solvent-based synthetic rubber
 - 2. CCW-704 solvent-based rubber-modified asphalt
 - D. Fill Compound, select either:
 - 1. CCW-703 V Modified polyurethane, 2-part
 - 2. CCW-201 Polyurethane, 2-part
 - E. Aerosol Insulation Adhesive: CAV-GRIP™
- 2.3 RELATED MATERIALS BY OTHERS
- A. Joint Sealant, select either:
 - 1. CCW-201 non-sag, 2-part polyurethane
 - 2. Sealant approved by Manufacturer. Shall conform to ASTM C 920 Type 1 or 2, Grade NS, Class 25 or 50.
 - B. Polyurethane Foam, approved by Manufacturer, select either:
 - 1. 1-part, can dispense
 - 2. 2-part

- C. Insulation Adhesive: select product approved by Manufacturer

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions affecting installation of the air & vapor barrier and accessory products for compliance with requirements. Verify that surfaces and conditions are suitable prior to commencing Work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Concrete shall be cured for a minimum of seven days.
- C. Surfaces shall be sound, dry and free of oil, grease, dirt, excess mortar or other contaminants.
- D. Surfaces shall be supported and flush at joints without large voids or sharp protrusions.
- E. Masonry joints shall be struck flush and completely filled with mortar. Mortar droppings shall be removed from masonry ties and surfaces.
- F. Damaged or improperly-fastened sheathing shall be remedied to comply with building code and sheathing manufacturer's requirements.
- G. Inform Architect and Construction Manager in writing of:
1. Cracks in concrete and masonry.
 2. Gaps or obstructions such as steel beams, angles, plates and projections which cannot be spanned or covered by Product or Accessories.
 3. Anticipated problems applying Product and Accessories over substrate.

3.2 SURFACE PREPARATION

[NOTE TO SPECIFIER: Incorporate Paragraph A and its sub-paragraphs into Section 04 20 00 - Unit Masonry]

- A. [Note to Mason: This project will have self-adhering Air and Vapor Barrier material applied to the cavity side of the CMU. Special attention and care must be taken to provide a smooth, filled surface to receive the membrane. The care is necessary to insure the design performance of the selected materials.] Concrete masonry unit (CMU) wall shall be prepared as follows to accept the air & vapor barrier:
1. Surfaces shall be free of contaminants such as grease, oil and wax on surfaces to receive membrane
 2. The CMU surfaces shall be free from projections.
 3. Strike all mortar joints full and flush to the face of the concrete block.
 4. Fill all voids and holes greater than ½ inch across at any point with mortar, sealant or other approved fill material.

5. Fill all cracks, gaps and joints exceeding ¼ inch width with mortar, sealant or other approved fill material.
6. Surface irregularities exceeding ¼ inch in height or sharp to touch shall be ground flush or made smooth.
7. Fill around all penetrations with mortar, sealant or other approved fill material and strike flush.
8. If the surfaces cannot be made smooth to the satisfaction of the Architect, it will be the responsibility of the trade to alternatively apply a parge coat (typically one part cement to three parts sand) over the entire surface to receive Air & Vapor Barrier Membrane
9. Remove mortar droppings on brick ties, shelf angles, brick shelves or other horizontal obstructions.

B. Fill cracks, gaps and joints exceeding ¼ inch width with fill compound or joint sealant.

C. Fill rough gaps around pipe, conduit and similar penetrations with mortar, non-shrink grout or Polyurethane Foam.

3.3 INSTALLATION

A. Allow sealants used during surface preparation to cure fully before applying Product.

B. Apply Contact Adhesive to substrate according to Manufacturer's instructions.

C. Apply Product to prepared surfaces according to Manufacturer's instructions and drawings.

D. Laps between adjacent pieces of sheet membrane shall be 2 inches or greater.

E. Sheet membrane shall bear 3 inches minimum onto dissimilar substrates.

F. Cut edges, penetrations, non-shingled laps and similar surface defects of installed Product shall be sealed with Mastic.

3.4 SCHEDULE

A. Seal penetrations made through installed Product according to Manufacturer's instructions and drawings.

B. Through-wall flashing installed before or after Product:

1. Self-adhering type in accordance with Section 07 65 26
2. EPDM type in accordance with Section 07 65 23

C. Fenestration installed before or after Product: provide air and water seal between fenestration and opaque wall according to Manufacturer's instructions and drawings.

D. Board insulation installed after Product: Attach with Aerosol Insulation Adhesive plus mechanical fasteners or with insulation adhesive by others. Seal board joints in accordance with insulation manufacturer's instructions.

E. Roof air barrier: join to Product according to Manufacturer's instructions and drawings.

3.5 REPAIR AND PROTECTION

- A. Protect from damage during application and remainder of construction period.
- B. Inspect before covering. Repair or replace damaged material according to Manufacturer's instructions and drawings.
- C. Product and Accessories are not designed for permanent exposure. Cover with insulation or exterior cladding as soon as schedule allows.
- D. Outdoor exposure of installed Product shall not exceed 60 days.

END OF SECTION 07 27 13

SECTION 07 41 13 - METAL ROOF PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Architectural roofing system of preformed aluminum panels (interior coach office at pool).
- B. Attachment system.
- C. Finishes.
- D. Accessories.

1.2 RELATED REQUIREMENTS

- A. Section 05 31 00 - Steel Roof Deck
- B. Section 06 10 00 - Rough Carpentry: Roof sheathing.
- C. Section 07 60 00 - Flashing and Sheet metal
- D. Section 07 92 00 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

1.3 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix);
- B. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- C. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- D. ANSI MCA - FTS-1 Perimeter Edge Metal Roof Flashing Standard
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. ICC-ES AC188 - Acceptance Criteria for Roof Underlayment;
- G. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- H. AAMA 612- Voluntary Specification, Performance requirements and Test procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Summary of test results, indicating compliance with specified requirements.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Specimen warranty.
- C. Installer Qualification Statement
- D. Manufacturers Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayment, and special conditions as prepared by panel manufacturer.
 - 1. Show work to be field-fabricated or field-assembled.
- E. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.
- G. Test Reports: Indicate compliance of metal roofing system to specified requirements.
- H. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.
 - 1. Certified ISO 9001:2015 with Design
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- C. Source Limitations: Obtain components for roofing system from or approved by roofing system manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Provide strippable plastic protection on prefinished roofing panels for removal after installation.
- B. Package metal panels for protection during transportation and handling.

- C. Examine materials upon delivery to jobsite. Reject and remove physically damaged or marred material.
- D. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.7 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading or chalking within specified warranty period of 30 years from Date of Substantial Completion.
- C. Product Warranty: Provide manufacturer's standard warranty covering failure in materials caused by manufacturing within specified warranty period of 20 years from the Date of Substantial Completion
- D. Special Installers Warranty: Provide form in which Roofing Installer agrees to repair or replace components of custom fabricated sheet metal roofing system that fail in materials or workmanship within five years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: ATAS International, Inc.

- 1. HCS120

2.2 ARCHITECTURAL METAL ROOF PANELS

- A. Architectural Metal Roofing: Provide complete engineered roof system complying with specified requirements, including roof panels, clips, fasteners and miscellaneous accessories, to provide a weathertight assembly.
- B. Substitutions: See Section 01 6000 - Product Requirements
 - 1. Substitutions will be considered only if materials meet requirements of Basis of Design and are approved by Architect in writing 10 days prior to bid.
 - 2. Site formed panels will not be approved.
- C. Metal Panels: Factory-formed panels manufactured on fixed base roll former, a minimum of 12 roller stands, with factory-applied finish.
 - 1. Thermal Movement Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 150 degrees F.

- a. Aluminum Panels
 - 1) Alloy and Temper: Aluminum complying with ASTM B209 (ASTM B209M); temper as required for forming
 - 2) Thickness: Minimum 20 gauge (.032 inch)
- b. Clipless, one-piece, positive-locking, standing seam panel installed by hooking the enters through pre-punched slots to allow for expansion and contraction. The fasteners are covered by the adjacent panel.
- c. Texture: Smooth
- d. Plank Ribs
- e. Standing Seam design to incorporate no exposed cut edge and provide unlimited panel movement along length of slope.
- f. Length: Full length of roof slope, without lapped horizontal joints.
- g. Site formed panels will not be approved (subject to panel length).
- h. Width: Maximum panel coverage of 12 3/8 inches.

2.3 ATTACHMENT SYSTEM

2.4 FABRICATION

- A. Panels: Provide factory fabricated panels with applied finish and accessory items, using Provide panel profile for full length of panel, including stiffening rib.
- B. Factory applied seam sealant shall be non-curing butyl.
- C. Conceal fasteners where possible. Exposed fasteners are not allowed on faces of flashings and accessories exposed to view.
- D. Fabricate cleats and other attachments from the same material or compatible, non-corrosive materials.
- E. Follow Manufacturer's standard processes as recommended to achieve specified appearance and performance requirements.

2.5 FINISHES

- A. Below are for PVDF Colors only
 - 1. Protect painted finishes on exposed surface from damage by applying a strippable, temporary protective covering.
 - 2. Cleaning and Pretreatment:
 - a. Wet chemistry technology
 - b. Complex Chrome oxide pretreatment
 - c. Chrome final rinse

3. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated aluminum surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.009 inch (0.23 mm); color and gloss as selected by Architect to match sample.
4. Standard color to be chosen later.
5. Color:
 - a. Standard color to be chosen later
6. Panel backside finish; Manufacturer's standard backcoat system consisting of a wash coat finish over appropriate primer.

2.6 ACCESSORIES

- A. Miscellaneous Sheet Metal Items: Provide factory formed flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
 1. Fabricate trim and flashing components in minimum 12'-0 lengths, or as dictated by project conditions and approved by panel manufacturer
- B. Rib and Ridge Closures: Provide prefabricated, factory pre-notched closures to match the rib profile close-fitting components of .032 Aluminum in the same color and finish as roofing panel.
- C. Sealants: warren
 1. Exposed Sealant: High Performance Elastomeric; clear tri-polymer, as recommended by manufacturer.
 2. Concealed Sealant: High Performance Space Cubes to prevent bottoming out of sealant when fasteners are installed non-curing butyl tape.
 3. Seam Sealant: Factory Applied High Performance, high solid, non-skinning, non-drying formulated for roll forming application into concealed panel joints.
- D. Fasteners: Provide as recommended by panel manufacturer suitable for application meeting the following characteristics.
 1. Self-tapping and Self-drilling for metal to metal.
 2. Self-tapping wood screws for metal to wood applications.
 3. Carbon steel thread with organic long-life coating.
 4. Exposed fasteners type 304 stainless steel cap head.
 - a. Encapsulated EPDM washer
 - b. Baked on High performance compatible, chip resistant finish to match panel color.
- E. Field Touch up Paint; As dictated by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.
 - 1. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required.
 - 2. Examine primary and secondary roof framing to verify that rafter, purlins, angles, channels, and other structural support members and anchorages have been installed within alignment tolerances required by metal panel manufacturer.
 - 3. Examine roughing-in for components and systems penetrating metal roof panels to verify locations of penetrations relative to seam locations of metal roof panel prior to installation.
- B. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Broom clean wood sheathing prior to installation of roofing system.
- B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.
- C. Coordinate installation of waterproof membrane over roof sheathing with 06 10 00.
- D. Remove protective film from surface of roof panels and associated trims immediately prior to installation. Strip film carefully, to avoid damage to prefinished surfaces.
- E. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.
- F. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.3 INSTALLATION

- A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
- B. Install Underlayment on roof deck following governing codes before installing preformed metal roof panels. Secure by methods acceptable to roof panel manufacturer, minimizing use of metal fasteners. Apply from eaves to ridge in shingle fashion, overlapping horizontal joints a minimum of 2 inches (50 mm) and side and end laps a minimum of 3 inches (75 mm). Offset seams in underlayment.

- C. ASV Shims: Install ASV shims through fastened under clips per air space listed on shop drawings or required by code.
- D. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
- E. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches or grinders for field cutting is absolutely prohibited.
- F. Accessories: Install all components required for a complete roofing assembly, including flashings, trim, moldings, closure strips, preformed crickets, caps, rib closures, ridge closures, and similar roof accessory items.
- G. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
- H. Shim or otherwise plum substrate receiving metal panels.
- I. Align bottom of metal panel straight and true to drip eave.
 - 1. Anchor securely in place using manufacturers spacing and fastening pattern.
- J. Install roofing system as recommended by manufacturer to projects specific circumstances.
- K. Install flashing and trim without buckling and tool marks, exposed edges hemmed as metal work proceeds.
 - 1. Locate and space all flashing in uniform vertical and horizontal alignment providing for thermal expansion of exposed flashings and trim.
- L. Accessory Installation with positive anchorage to the building and weathertight mounting. Coordinate with other trades as required.

3.4 CLEANING

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.5 PROTECTION

- A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.
- B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

3.6 FIELD QUALITY CONTROL

- A. Manufacturers Field Service: Engage an independent third party factory-authorized service representative to inspect completed metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, at the Contractors expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 07 41 13

SECTION 07 52 00 - MODIFIED BITUMINOUS MEMBRANE ROOFING -HOT APPLIED

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes modified bituminous roofing system.
- B. Roof Insulation
- C. Accessories
- D. Edge Treatment and Roof Penetration Flashing.

1.2 REFERENCES

- A. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7-05, Minimum Design Loads for Buildings and Other Structures.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D41 Standard Specification for Asphalt Primer Used in Roofing, Dampproofing and Waterproofing.
 - 2. ASTM D312, Type III "Steep" Standard Specification for Asphalt Used in Roofing.
 - 3. ASTM D1079 Standard Terminology Relating to Roofing, Waterproofing and Bituminous Materials.
 - 4. ASTM D1863 Standard Specification for Mineral Aggregate Used as a Protective Coating for Roofing.
 - 5. ASTM D2178 Standard Specification for Asphalt Glass Felt Used as a Protective Coating for Roofing.
 - 6. ASTM D4586 Standard Specification for Asphalt Roof Cement.
 - 7. ASTM D2824 Standard Specification for Aluminum-Pigmented Asphalt Roof Coating.
 - 8. ASTM D5147 Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.
 - 9. ASTM D6162 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
 - 10. ASTM D6163 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
 - 11. ASTM E108 Standard Test Methods for Fire Test of Roof Coverings.
- C. Factory Mutual Research (FM):
 - 1. Roof Assembly Classifications. FM Global 1-90a.

- D. National Roofing Contractors Association (NRCA):
 - 1. Roofing and Waterproofing Manual.
- E. Underwriters Laboratories, Inc. (UL):
 - 1. Fire Hazard Classifications.
- F. Warnock Hersey (WH):
 - 1. Fire Hazard Classifications.
- G. American National Standards Institute and Single Ply Roofing Institute (ANSI/SPRI)
 - 1. ANSI/SPRI ES-1 Testing and Certification Listing of Shop Fabricated Edge Metal

1.3 SUBMITTALS FOR REVIEW

- A. Product Data: Provide manufacturer's technical product data for each type of roofing product specified. Include data substantiating that materials comply with specified requirements.
- B. Samples: Submit two (2) samples of the following:
 - 1. 1 lb. sample of roofing aggregate for review.
- C. Specimen Warranty: Provide an unexecuted copy of the warranty specified for this Project, identifying the terms and conditions required of the Manufacturer and the Owner.
- D. Any material submitted as equal to the specified material must be accompanied by a report signed and sealed by a professional engineer licensed in the state in which the installation is to take place. This report shall show that the submitted equal meets the Design and Performance criteria in this specification. Substitution requests submitted without licensed engineer approval will be rejected for non-conformance.

1.4 SUBMITTALS FOR INFORMATION

- A. Manufacturer's Installation Instructions: Submit installation instructions and recommendations indicating special precautions required for installing the membrane.
- B. Manufacturer's Certificate: Certify that roof system furnished is approved by Factory Mutual, Underwriters Laboratories, Warnock Hersey or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.
- C. Manufacturer's Certificate: Certify that the roof system is adhered properly to meet or exceed the requirements of FM [1-90].
- D. Manufacturer's Certificate: Certify that the roof system furnished is approved or accepted by Factory Mutual Approval Standard 4470.

- E. Manufacturer's Certificate: Certify that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.
- F. Manufacturer's Certificate: Submit a certified copy of the roofing manufacturer's ISO 9001 compliance certificate.
- G. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147.
- H. Written certification from the roofing system manufacturer certifying the applicator is currently authorized for the installation of the specified roof system.
- I. Design Loads: Submit copy of manufacturer's minimum design load calculations according to ASCE 7-05, Method 2 for Components and Cladding, sealed by a registered professional engineer. In no case shall the design loads be taken to be less than those detailed in Design and Performance Criteria article of this specification.
- J. Qualification data for firms and individuals identified in Quality Assurance Article below.
- K. Test Reports: Submit third party validation of environmental claims, prepared UL Environment, and for all modified bituminous sheet material containing recycled content and/or bio based content.

1.5 CONTRACT CLOSEOUT SUBMITTALS

- A. General: Comply with Requirements of Division 01 Section - Closeout Submittals.
- B. Special Project Warranty: Provide specified warranty for the Project, executed by the authorized agent of the Manufacturer.
- C. Roofing Maintenance Instructions. Provide a manual of manufacturer's recommendations for maintenance of installed roofing systems.
- D. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.
- E. Demonstration and Training Schedule: Provide a schedule of proposed dates and times for instruction of Owner's personnel in the maintenance requirements for completed roofing work. Refer to Part 3 for additional requirements.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with not less than 12 years documented experience and have ISO 9001 certification.
- B. Installer Qualifications: Company specializing in modified bituminous roofing installation with not less than 5 years' experience and authorized by roofing system manufacturer as qualified to install manufacturer's roofing materials.

- C. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while roofing work is in progress. Maintain proper supervision of workmen.
- D. Maintain a copy of the Contract Documents in the possession of the Supervisor/Foreman and on the roof at all times.
- E. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer.
 - 1. Upon request of the Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.
- F. Source Quality Control: Manufacturer shall have in place a documented, standardized quality control program such as ISO-9001.

1.7 PRE-INSTALLATION CONFERENCE

- A. Pre-Installation Roofing Conference: Convene a pre-roofing conference approximately two (2) weeks before scheduled commencement of modified bituminous roofing system installation and associated work.
- B. Require attendance of installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in and around roofing that must precede or follow roofing work (including mechanical work if any), Architect, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where applicable) Owner's insurers, testing agencies and governing authorities. Objectives of conference include:
 - 1. Review foreseeable methods and procedures related to roofing work, including set up and mobilization areas for stored material and work area.
 - 2. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work performed by others.
 - 3. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
 - 4. Review roofing system requirements (drawings, specifications and other contract documents).
 - 5. Review required submittals both completed and yet to be completed.
 - 6. Review and finalize construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
 - 7. Review required inspection, testing, certifying and material usage accounting procedures.
 - 8. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not mandatory requirement).
 - 9. Record discussion of conference, including decisions and agreements, (or disagreements) reached, and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.

10. Review notification procedures for weather or non-working days.

- C. The Owner's Representative will designate one of the conference participants to record the proceedings and promptly distribute them to the participants for record.
- D. The intent of the conference is to resolve issues affecting the installation and performance of roofing work. Do not proceed with roofing work until such issues are resolved to the satisfaction of the Owner. This shall not be construed as interference with the progress of Work on the part of the Owner or.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.
- B. Store and handle roofing sheets in a dry, well-ventilated, weather-tight place to prevent moisture exposure. Store rolls of felt and other sheet materials on pallets or other raised surface. Stand all roll materials on end. Cover roll goods with a canvas tarpaulin or other breathable material (not polyethylene).
- C. Do not leave unused materials on the roof overnight or when roofing work is not in progress unless protected from weather and other moisture sources.
- D. Secure all material and equipment on the job site. If any material or equipment is stored on the roof, assure that the integrity of the deck is not compromised at any time. Damage to the deck caused by the Contractor's actions will be the sole responsibility of the Contractor, and the deck will be repaired or replaced at his expense.

1.9 MANUFACTURER'S INSPECTIONS

- A. When the Project is in progress, the roofing system manufacturer will provide the following:
 - 1. Report progress and quality of the work as observed.
 - 2. Provide periodic job site inspections, minimum 3 days per week.
 - 3. Report to the Owner in writing any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.
 - 4. Confirm after completion that manufacturer has observed no application procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.10 PROJECT CONDITIONS

- A. Proceed with roofing work only when existing and forecasted weather conditions will permit a unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.
- B. Do not apply roofing insulation or membrane to damp deck surface.

- C. Do not expose materials subject to water or solar damage in quantities greater than can be weatherproofed during same day.

1.11 SEQUENCING AND SCHEDULING

- A. Sequence installation of roofing with related units of work specified in other Sections to ensure that roof assemblies, including roof accessories, flashing, trim and joint sealers, are protected against damage from effects of weather, corrosion and adjacent construction activity.
- B. Complete all roofing field assembly work each day. ***Phased construction will not be accepted.***

1.12 WARRANTY

- A. Upon completion of installation, and acceptance by the Owner, the Manufacturer will supply to the Owner the 30 year “No Dollar Limit” warranty.
- B. Installer will submit a 2-year warranty to the membrane manufacturer with a copy directly to Owner.

1.13 DESIGN AND PERFORMANCE CRITERIA

- A. Uniform Wind Uplift Load Capacity
 - 1. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria. Attachment shall be installed exactly as given in Part 3.
 - a. Design Code: ASCE 7-05, Method 2 for Components and Cladding.
 - b. Category III Building with an Importance Factor of 1.15
 - c. Wind Speed: 90 mph
 - d. Ultimate Pullout Value: 456 pounds per each of the fastener
 - e. Exposure Category: C
 - f. Design Roof Height: 40 feet.
 - g. Minimum Building Width: 115 feet.
 - h. Roof Pitch: Existing 1/8" per foot.
 - i. Topographic Factor: 1.00
 - 1) Roof Area Design Uplift Pressure:
 - 2) Zone 1 - Field of roof 25.0 psf
 - 3) Zone 2 - Eaves, ridges, hips and rakes 41.9 psf
 - 4) Zone 3 - Corners 63.0 psf
 - 2. Snow Load: 31 psf.
 - 3. Live Load: 20 psf, or not to exceed original building design.
 - 4. Dead Load:
 - a. Installation of new roofing materials shall not exceed the dead load capacity of the existing roof structure.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. Basis of Design: Materials, manufacturer's product designations, and/or manufacturer's names specified herein shall be regarded as the minimum standard of quality required for work of this Section. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.
- B. Substitutions: Products proposed as equal to the products specified in this Section shall be submitted in accordance with Bidding Requirements and Division 01 provisions.
 - 1. Proposals shall be accompanied by a copy of the manufacturer's standard specification Section. That specification Section shall be signed and sealed by a professional engineer licensed in the state in which the installation is to take place. Substitution requests containing specifications without licensed engineer certification shall be rejected for non-conformance.
 - 2. Include a list of three (3) projects of similar type and extent, located within a one hundred mile radius from the location of the project. In addition, the three projects must be at least five (5) years old and be available for inspection by the Architect, Owner or Owner's Representative.
 - 3. Equivalency of performance criteria, warranty terms, submittal procedures, and contractual terms will constitute the basis of acceptance.
 - 4. The Owner's decision regarding substitutions will be considered final. Unauthorized substitutions will be rejected.

2.2 ACCEPTABLE MANUFACTURERS

- A. The design is based upon roofing systems engineered and manufactured by The Garland Company or approved equals:

The Garland Company
 3800 East 91st Street
 Cleveland, Ohio 44105
 Telephone: (800) 762-8225
 Website: www.garlandco.com

2.3 DESCRIPTION

- A. Modified bituminous roofing work including but not limited to:
 - 1. Minimum two (2) plies of approved ASTM D2178, Type IV glass fiber roofing felt bonded to the prepared substrate with hot bitumen.
 - 2. Hot Bitumen: ASTM D312, Type III steep asphalt having the following characteristics:
 - a. Softening Point 185°F - 205°F

- b. Flash Point 500°F
 - c. Penetration @ 77°F 15-35 units
 - d. Ductility @ 77°F 2.5 cm
3. Base Flashing Ply: One (1) ply of 80 mil SBS base flashing ply covered by an additional layer of modified bitumen membrane and set in bitumen.
 4. Modified Membrane: STRESSPLY Legacy; 80 mil SBS and SIS (Styrene-Butadiene-Styrene and Styrene-Isoprene-Styrene) rubber modified roofing membrane reinforced with a dual fiberglass scrim and polyester mat.
 5. Surfacing: Flood coat of hot bitumen and ASTM D1863 roofing aggregate consisting of slag, pea gravel, or white spar.
 6. Hot Surfacing Bitumen: ASTM D312, Type III steep asphalt having the following characteristics:
 - a. Softening Point 185°F - 205°F
 - b. Flash Point 500°F
 - c. Penetration @ 77°F 15-35 units
 - d. Ductility @ 77°F 2.5 cm
 7. Non-Volatile Content ASTM D4586 100%
 8. Density ASTM D1475 11.2 lbs./gal.
 9. Viscosity Stormer ASTM D562 16-20 sec.
 10. Flash Point ASTM D93 400 F min.
 11. Slope: up to 3:12
 12. Roofing Aggregate: To conform to ASTM D1863
 - a. Slag, Pea Gravel or White Spar

2.4 BITUMINOUS MATERIALS

- A. Asphalt Primer: V.O.C. compliant, ASTM D41.
- B. Asphalt Roofing Mastic: V.O.C. compliant, ASTM D4586, Type II.
- C. Interply Adhesive: ASTM D312, Type III.

2.5 SHEET MATERIALS

- A. Felt Plies: Fiberglass Felts: ASTM D2178, Type IV. HPR Glasfelt as manufactured by the Garland Company.
- B. Base Flashing Ply: 80 mil SBS modified membrane with woven fiberglass scrim reinforcement with the following minimum performance requirements according to ASTM D5147. Properties (Finished Membrane):
 1. Tensile Strength (ASTM D5147):
 - a. 2 in/min. @73.4 ± 3.6°F: MD 550 lbf/in CMD 550 lbf/in
 - b. 50mm/min. @ 23 ± 2°C MD 96.2 kN/m CMD 96.2 kN/m

2. Tear Strength (ASTM D5147)
 - a. 2 in/min. @ 73.4 ± 3.6°F MD 1000 lbf CMD 1000 lbf
 - b. 50mm/min. @ 23 ± 2°C MD 4448 N CMD 4448 N
3. Elongation at Maximum Tensile (ASTM D5147)
 - a. 2 in/min. @ 73.4 ± 3.6°F MD 9% CMD 9%
 - b. 50mm/min. @ 23 ± 3°C MD 9% CMD 9%
4. Low temperature flexibility, ASTM D 5147, Passes -40 deg. F (-40 deg. C)

C. Modified Flashing Ply:

1. STRESSPLY Legacy/Legacy FR Mineral (Flashings)

D. Modified Membrane Properties (Finished Membranes): STRESSPLY ELegacy; ASTM D6162, Type III Grade G

1. Tensile Strength (ASTM D5147):
 - a. 2 in/min. @ 73.4 ± 3.6°F MD 550 lbf/in CMD 500 lbf/in
 - b. 50 mm/min. @ 23 ± 2°C MD 96.25 kN/m CMD 87.5 kN/m
2. Tear Strength (ASTM D5147)
 - a. 2 in/min. @ 73.4 ± 3.6°F MD 575 lbf CMD 570 lbf
 - b. 50 mm/min. @ 23 ± 3°C MD 2557 N CMD 2535 N
3. Elongation at Maximum Tensile (ASTM D5147)
 - a. 2 in/min. @ 73.4 ± 3.6°F MD 10.0% CMD 10.0%
 - b. 50 mm/min. @ 23 ± 3°C MD 10.0% CMD 10.0%
4. Low Temperature Flexibility (ASTM D5147): Passes -30°F
5. Recycled Content (Pre-Consumer): 2%
6. Recycled Content (Pre-Consumer): 12
7. Bio-Based Content: 1%

2.6 ROOF INSULATION

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thickness indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.
 1. Base Layer Thickness on tapered decks: (2) layers 2.6" minimum R Value = R-30.
 2. Tapered insulation minimum thickness R-30 at low point, (min.1/8" per 12" roof slope at Roof B.)
 3. Class A: Flame spread 0-25; Smoke developed 0-450.

4. Available Manufacturers:
 - a. Atlas Roofing Corporation.
 - b. Celotex Corporation.
 - c. Firestone Building Products Company.
 - d. GAF Materials Corporation.
 - e. Honeywell Commercial Roofing Systems.
 - f. Johns Manville International, Inc.
 - g. Koppers Industries.
 - h. RMAX.

- C. Cover board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/4 inch thick.
 1. Product: Subject to compliance with requirements, provide “Securrock” by USG Corporation or Densdeck Prime by Georgia Pacific.

- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes in drain valleys for sloping to drain. Slope: 1/4” inch per foot. Width of cricket: minimum 12 feet.

- E. Insulation Accessories:
 1. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
 2. Fasteners: Triangle Sentry Plus Five Fastener for metal deck by Triangle Fastener, New Castle, DE.
 3. Tapered Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

2.7 ACCESSORIES:

- A. Roof Insulation: In accordance with 2.7 of this Section.

- B. Cover Board: Provide G-P Gypsum DenDeck Prime, G-P Gypsum DenDeck DuraGuard, USG Securrock for proper adhesion of the self-adhered base sheet.

- C. Vapor Retarder: HPR Torchbase SBS modified, torch applied sheet material. ASTM D 6163, Type II.
 1. Tensile Strength, ASTM D 5147
 - a. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 210 lbf/in XD 210 lbf/in.
 - b. 50 mm/min. @ 23 +/- 2 deg. C MD 210 lbf/in XD 210 lbf/in.

 2. Tear Strength, ASTM D 5147
 - a. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 250 lbf/in XD 1112 lbf/in.
 - b. 50 mm/min. @ 23 +/- 2 deg. C MD 250 lbf/in XD 1112 lbf/in.

 3. Elongation at Maximum Tensile, ASTM D 5147
 - a. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 4.0 % XD 4.0 %

- b. 50 mm/min@ 23 +/- 2 deg. C MD 4.0 % XD 4.0 %
- 4. Low Temperature Flexibility, ASTM D 5147: Passes -35 deg. F.

2.8 EDGE TREATMENT AND ROOF PENETRATION FLASHINGS

- A. Drain Flashings should be 4 lb. sheet lead formed and rolled.
- B. Liquid Flashing - Tuff-Flash: An asphaltic-polyurethane, low odor, liquid flashing material designed for specialized details unable to be waterproofed with typical modified membrane flashings.
 - 1. Tensile Strength, ASTM D 412: 400 psi
 - 2. Elongation, ASTM D 412: 300%
 - 3. Density @77 degrees F 8.5 lb/gal typical.
- C. Fabricated Flashings: Fabricated flashings and trim are specified in Section 07 62 00.
 - 1. Fabricated flashings and trim shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the CDA Copper Development Association "Copper in Architecture - Handbook" as applicable.
- D. Manufactured Roof Specialties: Manufactured copings, fascia, gravel stops, control joints, expansion joints, joint covers and related flashings and trim are specified in Sheet metal Flashings and Trim, Section 07 62 00.
 - 1. Manufactured roof specialties shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the NRCA "Roofing and Waterproofing Manual" as applicable.

2.9 RELATED MATERIALS

- A. Base Sheet: ASTM D4601, Type II; as recommended and furnished by the modified membrane manufacturer.
- B. Nails and Fasteners: Non-ferrous metal or galvanized steel, except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel. Fasteners shall be self-clinching type of penetrating type as recommended by the manufacturer of the deck material. Nails and fasteners shall be flush-driven through flat metal discs of not less than one (1) inch diameter. Omit metal discs when one-piece composite nails or fasteners with heads not less than one (1) inch diameter are used.
- C. Metal Discs: Flat discs or caps of zinc-coated sheet metal not lighter than twenty eight (28) gauge and not less than one (1) inch in diameter. Form discs to prevent dishing. Bell or cup shaped caps are not acceptable.

- D. Sealant: Single component, 100% solids structural adhesive as furnished and recommended by the membrane manufacturer.
 - 1. Elongation (ASTM D412) 300%
 - 2. Hardness, Shore A (ASTM C920) 50
 - 3. Shear Strength (ASTM D1002) 300 psi
- E. Butyl Tape: 100% solids, asbestos free and compressive tape designed to seal as recommended and furnished by the membrane manufacturer.
- F. Non-Shrink Grout: Use an all-weather fast setting chemical action concrete material to fill pitch pans.
 - 1. Flexural Strength (ASTM C78 (modified)) 7 days 1100psi
 - 2. High Strength (ASTM C109 (modified)) 24 days 8400lbs (3810kg)
- G. Pitch Pocket Sealer: Two part, 100% solids, self-leveling, polyurethane sealant for filling pitch pans as recommended and furnished by the membrane manufacturer.
 - 1. Durometer (ASTM D2240) 40-50 Shore
 - 2. Elongation (ASTM D412) 250%
 - 3. Tensile Strength (ASTM D412) 200 @ 100 mil
- H. Glass Fiber Cant: Continuous triangular cross Section made of inorganic fibrous glass used as a cant strip as recommended and furnished by the membrane manufacturer.
- I. Roof Drains: Drain system as recommended and furnished by the membrane manufacturer. Refer to Drawing Construction Note #4.
- J. Drain Flashings should be 4lb (1.8kg) sheet lead formed and rolled.
- K. Plumbing stacks should be 4lb (1.8kg) sheet lead formed and rolled.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that deck surfaces and project conditions are ready to receive work of this Section.
- B. Verify that deck is supported and secured to structural members.
- C. Verify that deck is clean and smooth, free of depressions, projections or ripples, and is properly sloped to drains.
- D. Verify that adjacent roof substrate components do not vary more than 1/4 inch in height.
- E. Verify that deck surfaces are dry and free of snow or ice. Verify that metal deck flutes are clean and dry.

- F. Verify that openings, curbs, pipes, conduit, sleeves, ducts, and other items which penetrate the roof are set solidly, and that [wood cant strips] [wood nailing strips] [and reglets] are set in place.

3.2 DECK PREPARATION

A. Metal Deck

- 1. Verify that all welds are good, that deck is in plane and that it is free from damage and deflection.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing the roof system.
- B. Insurance/Code Compliance: Where required by code, install and test the roofing system to comply with governing regulation and specified insurance requirements.
- C. Protect other work from spillage of roofing materials and prevent materials from entering or clogging drains and conductors. Replace or restore other work damaged by installation of the coal tar modified bituminous roofing system.
- D. Coordinate installation of roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut-offs at end of each day's work to cover exposed ply sheets and insulation with two (2) plies of #15 organic roofing felt set in full moppings of bitumen and with joints and edges sealed with roofing cement. Remove cut-offs immediately before resuming work.
- E. Asphalt Bitumen Heating: Heat and apply bitumen in accordance with the Equiviscous Temperature (EVT) Method as recommended by National Roofing Contractors Association (NRCA). Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (plus 5°F at point of application) more than one (1) hour prior to time of application. Determine flash point, finished blowing temperature, EVT, and fire-safe handling temperature of bitumen either from information by manufacturer or by suitable test. Do not exceed recommended temperature limits during bitumen heating. Do not heat to a temperature higher than twenty five degrees (25°F) below flash point. Discard bitumen that has been held at temperature exceeding Finishing Blowing Temperature (FBT) for more than three (3) hours. Keep kettle lid closed except when adding bitumen.
- F. Asphalt Bitumen Mopping Rate:
 - 1. Interply Mopping: Apply bitumen at the rate of approximately twenty five (25) lb. of bitumen per roof square.
 - 2. Modified Membrane Mopping: Apply bitumen at the rate of approximately thirty (30) lb. of bitumen per roof square.
 - 3. Flood Coat: Apply bitumen at the rate of approximately sixty (60) to seventy (70) lb. of bitumen per square (plus or minus twenty five (25) percent on a total job average basis).

- G. Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.
- H. Apply roofing materials as specified by manufacturer's instructions.
 - 1. Keep roofing materials dry before and during application.
 - 2. Do not permit phased construction.
 - 3. Complete application of roofing plies, modified sheet and flashing in a continuous operation.
 - 4. Begin and apply only as much roofing in one day as can be completed that same day.
- I. Cut-Offs (Waterstops): At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of two (2) plies of #15 organic roofing felt set in full mopping of bitumen with joints and edges sealed.

3.4 INSULATION INSTALLATION

- A. Deck type: Metal
- B. Install new wood blocking around the entire perimeter of the roof system. The wood blocking should be of sufficient height to accommodate the new insulation system. To be shimmed so wood blocking is flat.
- C. Attach 1/2" primed dens deck to metal deck. Then set two plies of type IV felt in type III hot asphalt over the dens deck for vapor retarder / temporary roof.
- D. Set two layers of 2.6" polyisocyanurate insulation all in hot asphalt.
- E. "Four way" insulation sumps shall be installed around all drain locations. Each sump shall be 8' x 8' and fashioned from 1/8" per linear foot tapered insulation with a minimum thickness of 1". Sump shall extend 4' in all directions from the center of the roof drain (see drain sump detail).
- F. Finally, a 1/2" high density fiberboard shall be set into full mopping of hot asphalt adhesive applied at the rate of 25lbs. / 100 sq. ft. Butt joints between layers of insulation board shall be staggered a minimum of 12".

3.5 FELT PLY INSTALLATION

- A. Fiberglass Plies: Install two (2) fiberglass ply sheets in twenty five (25) lbs. per square of bitumen shingled uniformly to achieve two plies over the entire prepared substrate. Shingle in direction of slope of roof to shed water on each area of roof. Do not step on felt rolls until asphalt has cooled, fish mouths should be cut and patched.
- B. Lap ply sheet ends eight (8) inches. Stagger end laps twelve (12) inches minimum.
- C. Lightly broom in fiberglass plies to assure complete adhesion.
- D. Extend plies two (2) inches beyond top edges of cants at wall and roof projections and equipment bases.

- E. Install base flashing ply to all perimeter and projection details after membrane application.

3.6 MODIFIED MEMBRANE APPLICATION

- A. Solidly bond the modified membrane to the base layers with specified asphalt at the rate of twenty five (25) to thirty (30) lbs. per 100 square feet.
- B. The modified membrane roll must push a puddle of asphalt in front of it with asphalt slightly visible at all side laps. Exercise care during application to eliminate air entrapment under the membrane.
- C. Apply pressure to all seams to ensure that the laps are solidly bonded to substrate.
- D. Install subsequent rolls of modified membrane across the roof as above with a minimum of four (4) inch side laps and eight (8) inch end laps. Stagger the end laps. Apply the modified membrane in the same direction as the previous layers but stagger the laps so they do not coincide with the laps of the base layers.
- E. Apply asphalt no more than five (5) feet ahead of each roll being embedded.
- F. Extend membrane two (2) inches beyond top edge of all cants in full mopping of the specified asphalt [as shown on the drawings].

3.7 FLASHING MEMBRANE INSTALLATION

- A. Seal all curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
- B. Prepare all walls, penetrations, expansion joints [and where shown on the drawings] to be flashed with asphalt primer at the rate of one hundred (100) square feet per gallon. Allow primer to dry tack free.
- C. Use the modified membrane as the flashing membrane. Adhere to the underlying base flashing ply with specified asphalt unless otherwise noted in these specifications. Nail off at a minimum of eight (8) inches o.c. from the finished roof at all vertical surfaces.
- D. Solidly adhere the entire sheet of flashing membrane to the substrate.
- E. Seal all vertical laps of flashing membrane with a three-course application of trowel-grade mastic and fiberglass mesh.
- F. Coordinate counter flashing, cap flashings, expansion joints, and similar work with modified bitumen roofing work [as specified in other Sections].
- G. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work [as specified in other Sections].
- H. Pre-Manufactured Metal Edge System: R-Mer Edge by the Garland Company

1. Position base plies of the built-up and/or modified roofing membrane over the roof edge covering nailers completely, fastening eight (8) inches on center. Install membrane and cap sheet with proper material and procedure according to manufacturer's recommendations.
2. Cant Dam: Install Cant Dam overlapping Cant a minimum of one (1) inch. Fasten Cant Dam every three (3) inches on center through the top of nailer and outside face.
3. BUR or Modified Flashing: Prime Cant Dam at a rate of one hundred (100) square feet per gallon and allow to dry.
4. Strip in Cant Dam with base flashing membrane extending six (6) inches into roof field, followed with a cap sheet extending nine (9) inches into the roof field. Install membrane and cap sheet with proper material and procedure according to manufacturer's recommendations.
5. Fascia Cover: Install fascia cover with splice plate under one end by pressing downward firmly until "snap" occurs and cover is engaged along entire length of miter. Field cut where necessary with fine tooth saw.
6. Sealant is to be placed between splice plates on metal edge pieces.
7. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches on to the field of the roof.

I. Surface Mounted Counterflashing [Detail No. MBH-22]:

1. Minimum flashing height is eight (8) inches. Maximum flashing height is twenty four (24) inches. Prime vertical wall at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of two (2) inches.
3. Install base flashing ply covering wall set in bitumen with six (6) inches on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches on to the field of the roof. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Apply butyl tape to wall behind flashing. Secure termination bar through flashing, butyl tape and into wall.
6. Secure counterflashing set on butyl tape above flashing at eight (8) inches o.c. and caulk top of counterflashing.

J. Expansion Joint [Detail No. MBH-30]:

1. Minimum curb height is eight (8) inches. Chamfer top of curb. Prime vertical curb at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Mechanically attach wood cant to expansion joint nailers. Run all field plies over cant a minimum of two (2) inches.

3. Install compressible insulation in neoprene cradle.
4. Install base flashing ply covering curb set in bitumen with six (6) inches on to field of the roof.
5. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches on to the field of the roof. Attach top of membrane to top of curb and nail at eight (8) inches o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
6. Install pre-manufactured expansion joint cover. Fasten sides at twelve (12) inches o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.

K. Equipment Support [Detail No. MBH-32]:

1. Minimum curb height is eight (8) inches. Prime vertical at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of two (2) inches.
3. Install base flashing ply covering curb set in bitumen with six (6) inches on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches on to the field of the roof. Attach top of membrane to top of curb and nail at eight (8) inches o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install pre-manufactured cover. Fasten sides at twenty four (24) inches o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.
6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

L. Curb Detail/Air Handling Station [Detail No. MBH-33]:

1. Minimum curb height is eight (8) inches. Prime vertical at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of two (2) inches.
3. Install base flashing ply covering curb set in bitumen with six (6) inches on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches on to the field of the roof. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install pre-manufactured counterflashing with fasteners and neoprene washers or per manufacturer's recommendations.
6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

M. Exhaust Fan [Detail No. MBH-36]:

1. Minimum curb height is eight (8) inches. Prime vertical at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all plies over cant a minimum of two (2) inches.
3. Install base flashing ply covering curb with six (6) inches on to field of the roof.
4. Install a second ply of modified flashing ply installed over the base flashing ply, nine (9) inches on to field of the roof. Attach top of membrane to top of wood curb and nail at eight (8) inches o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install metal exhaust fan over the wood nailers and flashing to act as counterflashing. Fasten per manufacturer's recommendation.

N. Passive Vent/Air Intake [Detail No. MBH-37]:

1. Minimum curb height is eight (8) inches. Prime vertical at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all plies over cant a minimum of two (2) inches.
3. Install base flashing ply covering curb with six (6) inches on to the field of the roof.
4. Install a second ply of modified flashing ply installed over the base flashing ply, nine (9) inches on to field of the roof. Attach top of membrane to top of wood curb and nail at eight (8) inches o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install passive vent/air intake over the wood nailers and flashing to act as counterflashing. Fasten per manufacturers recommendations.

O. Roof Drain [Detail No. MBH-40]:

1. Plug drain to prevent debris from entering plumbing.
2. Taper insulation to drains as specified from center of drain.
3. Run roof system plies over drain. Cut out plies inside drain bowl.
4. Set lead/copper flashing (thirty (30) inch square minimum) in (1/4) inch bed of mastic. Run lead/copper into drain a minimum of two (2) inches. Prime lead/copper at a rate of one hundred (100) square feet per gallon and allow to dry.
5. Install base flashing ply (forty (40) inch square minimum) in bitumen.
6. Install modified membrane (forty eight (48) inch square minimum) in bitumen.
7. Install clamping ring and assure that all plies are under the clamping ring.
8. Remove drain plug and install strainer.

P. Plumbing Stack [Detail No. MBH-50]:

1. Minimum stack height is twelve (12) inches.

2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in (1/4) inch bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Turn sleeve a minimum of one (1) inch down inside of stack.

Q. Heat Stack [Detail No. MBH-51]:

1. Minimum stack height is twelve (12) inches.
2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in (1/4) inch bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install modified membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Install new collar over cape. Weld collar or install stainless steel draw brand.

R. Pitch Pocket [Detail No. MBH-52]:

1. Run all plies up to the penetration.
2. Place the pitch pocket over the penetration and prime all flanges.
3. Strip in flange of pitch pocket with one (1) ply of base flashing ply. Extend six (6) inches onto field of roof.
4. Install second layer of modified membrane extending nine (9) inches onto field of the roof.
5. Fill pitch pocket half full with non-shrink grout. Let this cure and top off with pourable sealant.
6. Caulk joint between roof system and pitch pocket with roof cement.

3.8 APPLICATION OF SURFACING

A. Aggregate Surfacing:

1. Apply surfacing materials in the quantities specified - apply at rate of 4-5 gal./100 ft.² over newly constructed BUR and modified systems.
2. Aggregate shall be dry and placed in a manner required to form a compact, embedded overlay. To aid in proper embedment, lightly roll aggregate provided that there is no damage to the roofing membrane.

B. Reflective Coating on Flashing Surfaces:

1. Allow all cold applied mastics and coating to properly dry and cure before installing the aluminum coating.
2. Paint all exposed membrane with manufacturer's non-fibrated aluminum paint installed at a rate of one-half (1/2) gallon per square per coat. This shall be a two-coat application with the finished stroke in one direction.

3.9 FIELD QUALITY CONTROL

- A. Perform field inspection [and testing] as required [under provisions of Division 01 Section Quality Requirements].
- B. Correct defects or irregularities discovered during field inspection.
- C. Require attendance of roofing [and insulation] materials manufacturers' representatives at site during installation of the roofing system. A copy of the specification should also be on site at all times.

3.10 CLEANING

- A. Remove bitumen adhesive drippings from all walls, windows, floors, ladders and finished surfaces.
- B. In areas where finished surfaces are soiled by asphalt or any other sources of soiling caused by work of this Section, consult manufacturer of surfaces for cleaning instructions and conform to their instructions.
- C. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.11 CONSTRUCTION WASTE MANAGEMENT

- A. Remove and properly dispose of waste products generated during roofing procedures. Comply with requirements of authorities having jurisdiction.

3.12 FINAL INSPECTION

- A. At completion of roofing installation and associated work, meet with Contractor, Architect, installer, installer of associated work, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of roofing system.
- B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party in attendance.
- C. The roofing system manufacturer reserves the right to request a thermographic scan of the roof during final inspection to determine if any damp or wet materials have been installed. The thermographic scan shall be provided by the Roofing Contractor.
- D. If core cuts verify the presence of damp or wet materials, the Roofing Contractor shall be required to replace the damaged areas at his own expense.
- E. Repair or replace deteriorated or defective work found at time above inspection as required to produce an installation which is free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- F. Notify the Contractor, Architect and Owner upon completion of corrections.

- G. Following the final inspection, provide written notice of acceptance of the installation from the roofing system manufacturer.
- H. Immediately correct roof leakage during construction. If the Contractor does not respond within twenty four (24) hours, the Owner will exercise rights to correct the Work under the terms of the Conditions of the Contract.

3.13 DEMONSTRATION AND TRAINING

- A. At a time and date agreed to by the Owner, instruct the Owner's facility manager, or other representative designated by the Owner, on the following procedures:
 - 1. Roof troubleshooting procedures.
 - 2. Notification procedures for reporting leaks or other apparent roofing problems.
 - 3. Roofing maintenance.
 - 4. The Owner's obligations for maintaining the roofing warranty in effect and force.
 - 5. The Manufacturer's obligations for maintaining the roofing warranty in effect and force.

END OF SECTION 07 52 00

SECTION 07 53 00 - EPDM THERMOSET SINGLE-PLY ROOFING

1.GENERAL

1. SECTION INCLUDES

- A. EPDM thermoset single-ply roofing.
- B. Membrane flashings.
- C. Metal flashings.
- D. Roof insulation.
- E. Glass Mat Gypsum Sheathing

2. RELATED SECTIONS

3. REFERENCES

- A. American Society of Civil Engineers (ASCE) - ASCE 7 - Minimum Design Loads for Buildings and Other Structures, Current Revision.
- B. ANSI/SPRI WD-1 "Wind Design Standard for Roofing Assemblies".
- C. ASTM International (ASTM):
 - 1. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - 2. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - 3. ASTM D 624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 - 4. ASTM D 4637 - Standard Specification for EPDM Sheet Used In Single-Ply Roof Membrane.
 - 5. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
- D. Factory Mutual (FM Global):
 - 1. Approval Guide.
 - a. Factory Mutual Standard 4470 - Approval Standard for Class 1 Roof Covers.
 - b. Loss Prevention Data Sheets 1-28, 1-29.
- E. International Code Council (ICC):
 - 1. International Building Code (IBC).

- F. National Roofing Contractors Association (NRCA) - Low Slope Roofing and Waterproofing Manual, Current Edition.
 - G. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.
 - H. Underwriters Laboratories (UL):
 - 1. TGFU R1306 - "Roofing Systems and Materials Guide".
 - 2. UL-790 - Standard Test Method for Fire Tests of Roof Coverings.
 - I. ANSI/ASHRAE/IESNA Standard 90.1 (2007): Energy Standard for Buildings Except Low-Rise Residential Buildings
4. DESIGN CRITERIA
- A. Wind Uplift Performance:
 - 1. Roof system is designed to withstand wind uplift forces as calculated using the current revision of ASCE-7.
 - B. Fire Resistance Performance:
 - 1. Roof system will achieve a UL Class A rating when tested in accordance with UL-790.
 - C. Thermal Performance: Roof system will achieve a minimum R value not less than 30.
 - D. Drainage: Provide a roof system with positive drainage where all standing water dissipates within 48 hours after precipitation ends.
 - E. Building Codes:
 - 1. Roof system will meet the requirements of all federal, state and local code bodies having jurisdiction.
5. SUBMITTALS
- A. Submit under provisions of Section 01 30 00.
 - 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. Detail Drawings:
 - 1. Submit approved plan, section, elevation or isometric drawings which detail the appropriate methods for all flashing conditions found on the project.

2. Coordinate approved drawings with locations found on the Contract Drawings.
 - D. Selection Samples: For each finish product specified, two complete sets of chips representing manufacturer's full range of available colors, membranes, and thicknesses.
 - E. Verification Samples: For each finish product specified, two samples, minimum size 4 inches square representing actual product, color, and patterns.
6. QUALITY ASSURANCE
- A. Manufacturer Qualifications: All products specified in this section will be supplied by a single manufacturer with a minimum of twenty (20) years' experience.
 - B. Installer Qualifications:
 1. All products listed in this section are to be installed by a single installer with a minimum of five (5) years' demonstrated experience in installing products of the same type and scope as specified.
 2. Installer must be capable of extending the Manufacturer's Labor and Materials guarantee.
 3. Installer must be capable of extending the Manufacturer's No Dollar Limit guarantee.
7. DELIVERY, STORAGE, AND HANDLING
- A. Store products in manufacturer's unopened packaging until ready for installation.
 - B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.
8. PROJECT CONDITIONS
- 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 absolute limits.
 - B. Refer to Carlisle's Roofing System specification, Part II - Application, for General Job Site Considerations.
 - C. Safety Data Sheets (SDS) must be on location at all times during the transportation, storage and application of materials.
 - D. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.
 - E. When loading materials onto the roof, the Carlisle Authorized Roofing Applicator must comply with the requirements of the building owner to prevent overloading and possible disturbance to the building structure.

- F. Proceed with roofing work only when weather conditions are in compliance with the manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with the manufacturer's requirements and recommendations.
- G. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, new roof sections shall be protected and inspected upon completion for possible damage.
- H. Provide protection, such as 3/4 inch thick plywood, for all roof areas exposed to traffic during construction. Plywood must be smooth and free of fasteners and splinters.
- I. The surface on which the insulation or roofing membrane is to be applied shall be clean, smooth, dry, and free of projections or contaminants that would prevent proper application of or be incompatible with the new installation, such as fins, sharp edges, foreign materials, oil and grease.
- J. New roofing shall be complete and weathertight at the end of the work day.
- K. Contaminants such as grease, fats and oils shall not be allowed to come in direct contact with the roofing membrane.

9. WARRANTY

- A. At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's Total-System warranty, outlining its terms, conditions, and exclusions from coverage.
 - 1. 20 years.
 - 2. Coverage to be extended to include roof edge metal water tightness in accordance with terms stated in the Warranty document.
 - 3. To include Peak Wind Gusts of up to 72 MPH when measured at 10 meters above ground level.

2.PRODUCTS

1. MANUFACTURERS

- A. Basis of Design: Carlisle SynTec Systems, which is located at: P. O. Box 7000; Carlisle, PA 17013; ASD Toll Free Tel: ; 800-4-SYNTEC; Tel: ; 717-245-7000; Fax: ; 717-245-7053; Email: info@carlisesyntec.com; Web: <https://www.carlisesyntec.com> .

2. SCOPE / APPLICATION

- A. Roof System: Provide a waterproof roof system, capable of withstanding uplift forces as specified in Design Criteria.
- B. Base Flashing: Provide a waterproof, fully adhered base flashing system at all penetrations, plane transitions and terminations.

- C. Insulation: Provide a roof insulation system beneath the finish membrane.
3. VAPOR BARRIER
- A. VapAir Seal 725 Air/Vapor Barrier: reinforced composite aluminum foil with self-adhesive SBS backing and removable poly release film. Used for direct application over metal decks.
4. INSULATION
- A. SecurShield Polyiso: Rigid board with coated glass fiber mat facers (CGF) on both sides, meeting or exceeding the requirements of ASTM C 1289, Type II, Class 2.
 - 1. Compressive Strength: Grade 3 (25 psi) (173 kPa).
 - 2. Density: 2 lb per cubic foot minimum.
5. COVER BOARD
- B. Moisture-, mold- and impact-resistant, nonstructural fiber-reinforced gypsum panel made from 95 percent recycled materials. Securock, distributed by Carlisle.
 - 1. Board Thickness: 1/2"
2. THERMAL BARRIER
- C. Moisture-, mold- and impact-resistant, nonstructural fiber-reinforced gypsum panel made from 95 percent recycled materials. Securock, distributed by Carlisle.
 - 1. Board Thickness: 5/8"
2. ETHYLENE, PROPYLENE, DIENE TERPOLYMER (EPDM) MEMBRANE
- A. Sure-Seal Non-Reinforced Membrane: Cured, non-reinforced EPDM membrane meeting the requirements of ASTM D 4637 Type I.
 - 1. Attachment Method: Fully adhered.
 - 2. Color: Black.
 - 3. Membrane Thickness: 90 mil nominal.
 - 4. Sheet Dimensions:
 - a. Length: 100 feet maximum.
 - 5. Performance:
 - a. Tensile Strength: 1550 psi minimum.
 - b. Tear Resistance: 200 lbf/in minimum.
 - c. Elongation: 480 percent.
3. EDGINGS AND TERMINATIONS

- A. SecurEdge 200/300: A 24 gauge galvanized metal water dam. Cover to be made of .050 Alum with. Kynar finish to be selected from a list of manufacturer's standard colors.

3.EXECUTION

1. 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.

2. PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Do not commence work until all other work trades have completed jobs that require them to traverse the deck on foot or with equipment.

3. INSULATION - SYSTEM DESIGN (FLAT STEEL DECK AREAS)

A. Thermal barrier:

- 1. Type: Securock Gypsum Fiber by Carlisle SynTec.
- 2. Thickness: 5/8"
- 3. Attachment Method: Mechanically fastened to deck below.

B. Base Layer:

- 1. Type: Carlisle SecurShield.
- 2. Thickness: 2.6 inches + 1/2" thick Tapered Start = 3" minimum before Top Layer.
- 3. Attachment Method: Adhered with Flexible FAST Adhesive to 725TR Vapor Barrier over Thermal Barrier.

C. Next Layer:

- 1. Type: Carlisle SecurShield.
- 2. Thickness: 2.6 inches. (Total R-30)
- 3. Attachment Method: Adhered with Flexible FAST Adhesive to Insulation Layer below.

D. Tapered System:

- 1. Type: Carlisle SecurShield.
- 2. Field Slope: 1/4 inch per foot.
- 3. Sump Slope: 1/4 inch per foot.

4. Cricket Slope: 1/2 inch per foot.
5. Attachment Method: Adhered with Flexible FAST Adhesive to Insulation Layer below.

E. Cover Board:

1. Type: Securock Gypsum Fiber by Carlisle SynTec.
2. Thickness: 1/2"
3. Attachment Method: Adhered with Flexible FAST Adhesive to Insulation Layer below.

4. INSULATION - SYSTEM DESIGN (SLOPED STEEL DECK AREAS)

A. Thermal barrier:

1. Type: Securock Gypsum Fiber by Carlisle SynTec.
2. Thickness: 5/8"
3. Attachment Method: Mechanically fastened to deck below.

B. Base Layer:

1. Type: Carlisle SecurShield.
2. Thickness: 2.6 inches. (Total R-30)
3. Attachment Method: Adhered with Flexible FAST Adhesive to 725TR Vapor Barrier over Thermal Barrier.

C. Next Layer: (NOTE - POOL AREA ONLY GETS ADDITIONAL INSULATION - REFER TO DRAWINGS).

1. Type: Carlisle SecurShield.
2. Thickness: 2.6 inches. (Total R-45)
3. Attachment Method: Adhered with Flexible FAST Adhesive to Insulation Layer below.

D. Crickets and Sumps:

1. Type: Carlisle SecurShield.
2. Sump Slope: 1/4 inch per foot.
3. Cricket Slope: 1/2 inch per foot.
4. Attachment Method: Adhered with Flexible FAST Adhesive to Insulation Layer below.

E. Cover Board:

1. Type: Securock Gypsum Fiber by Carlisle SynTec.
2. Thickness: 1/2"
3. Attachment Method: Adhered with Flexible FAST Adhesive to Insulation Layer below.

5. INSULATION PLACEMENT

- A. Install insulation or membrane underlayment in multiple layers over the substrate with boards butted tightly together with no joints or gaps greater than 1/4 inch. Stagger joints both horizontally and vertically.

- B. Secure insulation to the substrate with the required mechanical fasteners or insulation adhesive in accordance with the manufacturer's current application guidelines.
- C. Do not install wet, damaged or warped insulation boards.
- D. Stagger joints in one direction unless joints are to be taped. Install insulation boards snug. Gaps between board joints shall not exceed 1/4 inch). Fill all gaps in excess of 1/4 inch with same insulation material.
- E. Wood nailers must be at least 3 1/2 inches wide or 1 inch wider than adjacent metal flange. Thickness must equal that of insulation but not less than 1 inch thickness.
- F. Miter and fill the edges of the insulation boards at ridges, valleys and other changes in plane to prevent open joints or irregular surfaces. Avoid breaking or crushing of the insulation at the corners.
- G. Do not install any more insulation than will be completely waterproofed each day.

6. INSULATION ATTACHMENT

- A. Securely attach insulation to the roof deck for Adhered Roofing Systems. Attachment must have been successfully tested to meet or exceed the calculated uplift pressure required by the International Building Code (ASCE-7) or ANSI/SPRI WD-1.
- B. Enhance the perimeter and corner areas in accordance with the International Building Code (ASCE-7) or ANSI/SPRI WD-1.
- C. Install insulation layers, maximum 4 feet by 4 feet, applied with adhesive, coverage rate as necessary to achieve the specified attachment and uplift rating. Press each board firmly into place after adhesive develops strings when touched, typically 1-1/2 to 2 minutes after adhesive was applied and roll with a weighted roller. Add temporary weight and use relief cuts to ensure boards are well adhered to. Stagger the joints of additional layers by a minimum of 6 inches.

7. MEMBRANE PLACEMENT AND ATTACHMENT (Fully Adhered)

- A. Unroll and position membrane without stretching. Allow the membrane to relax for approximately 1/2 hour before bonding. Fold the sheet back onto itself so half the underside of the membrane is exposed.
- B. Apply the Bonding Adhesive in accordance with the manufacturer's published instructions, to both the underside of the membrane and the substrate. Allow the adhesive to dry until it is tacky but will not string or stick to a dry finger touch.
- C. Roll the coated membrane into the coated substrate while avoiding wrinkles. Brush down the bonded half of the membrane sheet with a soft bristle push broom to achieve maximum contact.
- D. Fold back the unbonded half of the membrane sheet and repeat the bonding procedure.

- E. Install adjoining membrane sheets in the same manner, overlapping edges appropriately to provide for the minimum splice width. It is recommended that all splices be shingled to avoid bucking of water.
8. MEMBRANE SPLICING (Tape Splice)
- A. Overlap adjacent sheets and mark a line 1/2 inch out from the top sheet.
 - B. Fold the top sheet back and clean the dry splice area (minimum 2 1/2 inches) of both membrane sheets with Sure-Seal Primer as required by the membrane manufacturer.
 - C. Where Splice Tape is not Factory-Applied, apply Splice Tape to bottom sheet with the edge of the release film along the marked line. Press tape onto the sheet using hand pressure. Overlap tape roll ends a minimum of 1 inch.
 - D. Remove the release film and press the top sheet onto the tape using hand pressure.
 - E. Roll the seam toward the splice edge with a 2 inch wide steel roller.
 - F. Install Pressure-Sensitive "T" Joint Cover, a 6 inch wide section of Pressure-Sensitive Elastoform Flashing over all field splice intersections.
 - G. When using non-Pressure-Sensitive Elastoform Flashing or Elastoform Flashing, seal edges of flashing with Lap Sealant.
 - H. The use of Lap Sealant with tape splices is optional except at tape overlaps and cut edges of reinforced membrane where Lap Sealant is required.
9. FLASHING
- A. Wall and curb flashing shall be cured EPDM membrane. Continue the deck membrane as wall flashing where practicable.
 - B. Follow manufacturer's typical flashing procedures for all wall, curb, and penetration flashing including metal edging/coping and roof drain applications.
10. WALKWAYS
- A. Install walkways at all traffic concentration points (such as roof hatches, access doors, rooftop ladders, etc.) and all locations as identified on the Contract Drawings.
 - B. Adhere walkways pads to the EPDM membrane in accordance with the manufacturer's current application guidelines.
11. DAILY SEALS

- A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the work day, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.
- B. Use Sure-Seal Pourable Sealer or other acceptable membrane seal in accordance with the manufacturer's requirements.

12. CLEAN UP

- A. Perform daily clean-up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.
- B. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

13. PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 07 53 00

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Formed Products:

- a. Formed low-slope roof sheet metal fabrications.

2. Manufactured Products:

- a. Manufactured reglets and counterflashing.

B. Related Sections:

- 1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated 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. Fabricate and install roof flashing capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
 - 1. Wind Zone 2: For velocity pressures of 31 to 45 lbf/sq. ft.: 90-lbf/sq. ft. perimeter uplift force, 120-lbf/sq. ft. corner uplift force, and 45-lbf/sq. ft. outward force.
- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg. F, ambient; 180 deg. F, material surfaces.
- D. Shall be designed and tested for resistance in accordance with test methods RE-1, RE-2 and RE-3 of ANSI/SPRI ES-1 wind design standard for edge systems.

1.4 SUBMITTALS

- A. **Product Data:** For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. **Shop Drawings:** Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Identification of material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 - 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 4. Details of termination points and assemblies, including fixed points.
 - 5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
 - 6. Details of edge conditions, including counterflashings as applicable.
 - 7. Details of special conditions.
 - 8. Details of connections to adjoining work.
 - 9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.
- C. **Samples for Verification:** For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. **Sheet Metal Flashing:** 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 - 2. **Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications:** 12 inches long and in required profile. Include fasteners and other exposed accessories.
 - 3. **Accessories and Miscellaneous Materials:** Full-size Sample.
- D. **Warranty:** Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. **Fabricator Qualifications:** Shop that 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.
- B. **Sheet Metal Flashing and Trim Standard:** Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which 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: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Products: Subject to compliance with requirements that have been manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
 - 2. Manufacturers: Subject to compliance with requirements that have been manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Aluminum: ASTM B209.
 - 1. Finish: Clear Anodic Finish; AAMA 611, AA-M12C22A41, Class I.
 - 2. Surface: Smooth, flat.

3. Gauge/thickness .040" minimum.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- C. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- D. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Reglets: Units of type, material and profile indicated, 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. 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. Heckmann Building Products Inc.
 - b. Hickman, W. P. Company.
 - c. Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
 - d. Keystone Flashing Company, Inc.
 2. Material: Aluminum, 0.024 inch thick.

3. 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.
4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
5. Accessories:
 - a. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
6. Finish: Clear Anodic.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the 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 without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed 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 on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- E. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
- H. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.

- I. Do not use graphite pencils to mark metal surfaces.

2.6 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high, end dams where flashing is discontinuous. Fabricate from the following materials:
 1. As noted and detailed on drawing details.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Counterflashing: Fabricate from the following materials:
 1. Aluminum: 0.032 inch thick.
- B. Flashing Receivers: Fabricate from the following materials:
 1. Aluminum: 0.032 inch thick.

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.
 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.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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, solder, welding rods, 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 and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim without excessive oil canning, 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 will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of aluminum and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal joints as shown and as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg. F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg. F.
 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
- B. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.

3.4 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing as per details.

3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch 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."

3.6 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 manufacturers written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a 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 07 62 00

SECTION 07 71 00 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Reglets and counterflashings

- B. Related Sections:

- 1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Division 07 Section "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties 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.
- B. FM Approvals' Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-60. Identify materials with FM Approvals' markings.
- C. SPRI Wind Design Standard: Manufacture and install roof-edge flashings tested according to SPRI ES-1
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg. F, material surfaces.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:
 - 1. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 - 2. Details of termination points and assemblies, including fixed points.
 - 3. Details of special conditions
- C. Samples for Verification: For roof-edge flashings, reglets and counterflashings made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for roof-edge flashings.
- E. Maintenance Data: For roofing specialties to include in maintenance manuals.
- F. Warranty: Sample of special warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period. Manufacturer's 5 year warranty for damage due to wind uplift.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Products: Subject to compliance with requirements that have been manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
 - 2. Manufacturers: Subject to compliance with requirements that have been manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

2.2 EXPOSED METALS

- A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
 - 1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, or thicker.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:
 - 1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, or thicker.

2.3 CONCEALED METALS

- A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.
- C. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, G90 coating designation.

2.4 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. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
 - 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.

2. Fasteners for Copper Sheet: Copper, hardware bronze or passivated Series 300 stainless steel.
 3. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
 4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153 or ASTM F 2329.
- C. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane, polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- D. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 REGLETS AND COUNTERFLASHINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cheney Flashing Company.
 2. Fry Reglet Corporation.
 3. MM Systems Corporation.
- B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
1. 25 gauge galvanized steel with painted finish.
- C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal:
1. 0.040" aluminum.
- D. Accessories:
1. 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 reglet is provided separate from metal counterflashing.
 2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
- E. Aluminum Finish: Three-coat fluoropolymer.
1. Color: As noted on construction drawings to match Architect's samples.

2.6 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 and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- 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 specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.

2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance
- E. Seal joints with elastomeric sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.3 REGLET AND COUNTERFLASHING INSTALLATION

- A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.
- B. Embedded Reglets: See Division 04 Section "Unit Masonry" for installation of reglets.
- C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant. Fit counterflashings tightly to base flashings.

3.4 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 71 00

SECTION 07 72 00 - 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. This Section includes the following:
 - 1. Roof curbs
 - 2. Roof Hatches
- B. Related Sections include the following:
 - 1. Division 05 Section "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
 - 2. Division 06 Section "Rough Carpentry" for roof sheathing, wood cants, and wood nailers.
 - 3. Division 07 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated metal flashing and counterflashing, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
 - 4. Division 07 Section "Roof Specialties" for fascia and gravel stops.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide delegated design for Ansi/Spri ES-1 Wind Design Standard for Edge Systems.

1.4 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: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.
- C. 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.

D. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 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.
 1. With Architect's approval, adjust location of roof accessories that would interrupt roof drainage routes.

1.9 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers listed in other Part 2 articles.

2.2 METAL MATERIALS

- A. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and prepainted by coil-coating process to comply with ASTM A 755.
 - 1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792, Class AZ50 coated.
 - 2. Exposed Finishes: High-Performance Organic Finish (2-Coat Fluoropolymer): Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
 - a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements in AAMA 2604, except as modified below:
 - 1) Humidity Resistance: 2000 hours.
 - 2) Salt-Spray Resistance: 2000 hours.
- B. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and finish. Coil-coat finish as follows:
 - 1. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range.
- C. Steel Shapes: ASTM A 36, hot-dip galvanized to comply with ASTM A 123, unless otherwise indicated.
- D. Steel Tube: ASTM A 500, round tube, baked-enamel finished.
- E. Galvanized Steel Tube: ASTM A 500, round tube, hot-dip galvanized to comply with ASTM A 123.

2.3 MISCELLANEOUS MATERIALS

- A. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 1, 1 inch thick.
- B. Glass-Fiber Board Insulation: ASTM C 726, 1 inch thick.

- C. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- D. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- E. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.
- F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.
- G. Elastomeric Sealant: ASTM C 920, silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- H. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.4 ROOF CURBS

- A. Roof Curbs: Provide metal roof curbs, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Fabricate with welded or sealed mechanical corner joints, with integral metal cant and integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
 - 1. Manufacturers:
 - a. Conn-Fab Sales, Inc.
 - b. Metallic Products Corporation.
 - c. Uni-Curb, Inc.
 - 2. Material: Aluminum-zinc alloy-coated steel sheet, 0.079 inch thick.
 - a. Finish: Powder coat.
 - 3. Factory insulate curbs with 1-1/2-inch- thick, glass-fiber board insulation.
 - 4. Curb height may be determined by adding thickness of roof insulation and minimum base flashing height recommended by roofing membrane manufacturer. Fabricate units to minimum height of 12 inches, unless otherwise indicated.

2.5 ROOF HATCHES

- A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated single wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.

1. Manufacturers:
 - a. J. L. Industries, Inc.
 - b. Bilco
2. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. external and internal loads.
3. Type and Size: Single-leaf lid 48" x 48".
4. Curb and Lid Material: Aluminum-zinc alloy-coated steel sheet, 0.090 thick.
 - a. Finish: Powder coat.
5. Insulation: Cellulosic-fiber board.
6. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
7. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
8. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
9. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate hatch curbs with height tapered to match slope to level tops of units.
10. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
11. Ladder Safety Post: Manufacturer's standard ladder safety post. Post to lock in place on full extension. Provide release mechanism to return post to closed position.
 - a. Height: 42 inches above finished roof deck.
 - b. Material and Finish: Steel tube, baked enameled.
 - c. Diameter: Pipe with 1-5/8-inch OD tube.
12. Safety Railing System: Manufacturer's standard complete system including rails, clamps, fasteners, safety barrier at railing opening, and all accessories required for a complete installation.
 - a. Height: 42 inches above finished roof deck.
 - b. Pipe or Tube: 1-1/4-inch ID galvanized pipe or 1-5/8-inch OD galvanized tube.
 - c. Flat Bar: 2-inch- high by 3/8-inch- thick galvanized steel.
 - d. Chain Passway Enclosure: Galvanized proof coil chain with quick link on fixed end.
 - e. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
 - f. Pipe Ends and Tops: Covered or plugged with weather-resistant material.
 - g. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
 - h. Fabricate joints that will be exposed to weather in a watertight manner.
 - i. Close exposed ends of handrail and railing members with prefabricated end fittings.
 - j. Fasteners: Manufacturer's standard.

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 work.
 - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
 - 2. Verify dimensions of roof openings for roof accessories.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install roof accessories to fit substrates and to result in watertight performance.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action 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 exposed-to-view components of 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 underlayment.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.
- D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
- E. Roof Curb Installation:
 - 1. Set roof curb so top surface of roof curb is level.
- F. Roof Hatch Installation:
 - 1. Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.
 - 2. Attach safety railing system to roof hatch curb.
 - 3. Attach ladder safety post according to manufacturer's written instructions.
- G. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

3.3 TOUCH UP

- A. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Division 09 painting Sections.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.4 CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION 07 72 00

SECTION 07 81 00 - SPRAY-APPLIED FIRE RESISTIVE MATERIALS

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-Applied Fire-Resistive Materials (SFRMs).
- B. Related Requirements:
 - 1. Division 07 Section Intumescent Fire Resistive Materials.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
- B. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.4 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of fireproofing.

- C. Evaluation Reports: For fireproofing, from third party.
- D. Preconstruction Test Reports: For fireproofing.
- E. Field quality-control reports.

1.6 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.
- B. Mockups: Build mockups Indicate portion of Work represented by mockup on Drawings or draw mockup as separate element.
 - 1. Build mockup of 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.
- C. It is recommended that industry guidelines as noted in National Fireproofing Contractors Association (NFCA) 100 – Standard Practice for the Application of Spray-Applied Fire Resistive Materials (SFRMs) be maintained on the project site.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on fireproofing.
 - 1. Provide test specimens and assemblies representative of proposed materials and construction.
- B. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.
 - 1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E 736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 - 2. Density: Test for density according to ASTM E 605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 - 3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.
 - 4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

5. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 40 deg. F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours prior to, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing a minimum 4 complete air exchanges per hour and according to manufacturer's written instructions until Spray-Applied Fire Resistive Materials are dried and cured. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. 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/UL 263 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.
- E. Low-Emitting Materials: Fireproofing used within the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAY-APPLIED 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.

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

1. Medium Density SFRMs:

- a. Isolatak International: CAFCO® Blaze-shield Hp Series (Isolatak Type HP)
- b. Physical Properties:

- 1) Bond Strength: Minimum 430-lbf/sq. ft. (20.59-kPa) cohesive and adhesive strength based on field testing according to ASTM E 736.
- 2) Density: Not less than 22 lb/cu. ft. (350 kg/cu. m) as specified in the approved fire-resistance design, according to ASTM E 605.
- 3) Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
- 4) Combustion Characteristics: When tested in accordance with ASTM E 136 shall be noncombustible.
- 5) Surface-Burning Characteristics: When tested in accordance with ASTM E84 or CAN4-S102, the material shall exhibit the following surface burning characteristics:
- 6) Flame Spread Index [10] or less.
- 7) Smoke Developed [10] or less.
- 8) Compressive Strength: When tested in accordance with ASTM E761, the material shall not deform more than 10 percent when subjected to a crushing force of 7,344 psf (351 kPa).
- 9) Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
- 10) Deflection: No cracking, spalling, or delamination according to ASTM E 759.
- 11) Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
- 12) Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours according to ASTM E 859.
- 13) Fungal Resistance: When tested in accordance with ASTM G21, the material shall show resistance to mold growth for a minimum period of 28 days with or without the use of a mold inhibitor.

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. Fireproofing manufacturer shall be contacted for procedures on handling primed/painted steel.
- 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. Sealer: If required, a transparent-drying, water-dispersible, tinted protective coating as recommended by fireproofing manufacturer.
 - 1. Product: Subject to compliance with requirements, provide CAFCO® BOND-SEAL or CAFCO® BOND-SEAL Type X by Isolatek International.
- F. Topcoat: If required, a topcoat suitable for application over applied fireproofing; of type recommended by fireproofing manufacturer.
 - 1. Water-Based Permeable Topcoat: Factory-mixed formulation for brush, roller, or spray application over applied SFRM. Provide application at a rate of 30 sq. ft./gal.
 - a. Product: Subject to compliance with requirements, provide CAFCO® TOP-COTE by Isolatek International.

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. Clips, hangers, supports, sleeves and other attachments to the substrate are to be placed by others prior to the application of the fireproofing materials.
 - 3. The installation of ducts, piping, conduit or other suspended equipment shall not take place until the application of the fireproofing is complete in an area.
- B. Fire protection shall not be applied to steel floor decks prior to the completion of concrete work on that deck.

- C. The application of fireproofing to the underside of roof deck shall not commence until the roof is completely installed and tight, all penthouses are complete, all mechanical units have been placed, and construction roof traffic has ceased. When roof traffic is anticipated, as in the case of periodic maintenance, roofing pavers shall be installed as a walkway to distribute loads.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. 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. 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. Metal Decks:
 - 1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, has been completed.
 - 2. Do not apply fireproofing to underside of metal roof deck until roofing has been completed; prohibit roof traffic during application and drying of fireproofing.

3. When roof traffic is anticipated, as in the case of periodic maintenance, roofing pavers shall be installed as a walkway to distribute loads.
- E. 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.
- F. 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.
- G. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- I. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.
- J. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.
- K. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- L. Cure fireproofing according to fireproofing manufacturer's written recommendations.
- M. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- N. 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.
 2. For reference, utilize AWCI - Inspection Procedure for Field-Applied Sprayed Fire-Resistive Materials, Technical Manual 12-A; an annotated guide.
- B. Test and inspect 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. Application 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 manufacturers recommended trowel-applied product.

END OF SECTION 07 81 00

SECTION 07 81 20 - INTUMESCENT FIRE RESISTIVE MATERIALS

PART 1 - GENERAL

1.1 SCOPE

- A. This specification covers labor, materials, equipment, and application necessary for, and incidental to, the complete and proper installation of intumescent fire protection for application to steel structures and supports in accordance with all applicable requirements of contract documents.
- B. This specification shall be supplemented by the applicable requirements of building codes, insurance rating organizations and all other authorities having jurisdiction.

1.2 SECTION INCLUDES

- A. Intumescent fire protection material.
- B. Topcoat protective decorative finish.

1.3 RELATED SECTIONS

- A. Section 05 10 00: Structural Steel.
- B. Section 05 12 00 - 05 50 00: Structural steel and metal fabrications with reference to primer receiving fire protection materials.
- C. Section 07 81 00: Spray-Applied Fire Resistive Material.
- D. Section 07 27 00: Firestopping and Smoke Seals.
- E. Section 09 90 00: Painting.

1.4 REFERENCES

- A. Underwriters Laboratories (UL) Fire Resistance Directory.
- B. Underwriters Laboratories of Canada (ULC) - List of Equipment and Materials.
- C. Third Party Evaluation Services Report
 - 1. Test Standards and Practices
 - a. ANSI/UL 263 (ASTM E119) - Fire Tests of Building Construction and Materials.

- b. CAN/ULC-S101 - Standard Methods of Fire Endurance Tests of Building Construction and Materials.
 - c. ASTM E84 (UL723, CAN/ULC-S102) - Surface Burning Characteristics of Building Materials. Flame Spread Maximum: 5 and Smoke Developed Maximum: 35.
 - d. ASTM D2240 – Durometer Hardness (Shore D Only). Minimum: 67 Shore D.
 - e. ASTM D2794 – Impact Resistance. Intrusion minimum: 152 inch-lb.
 - f. ASTM D4060 – Abrasion Resistance. Maximum 0.2600 grams/1000 cycles.
 - g. ASTM D4541 – Bond Strength. Minimum: 340 psi.
 - h. ASTM E2924 – Standard Practice for Intumescent Coatings.
- D. Steel Structures Painting Council (SSPC) Surface Preparation Standards.
- E. Material manufacturer's current published information including, but not limited to, application guide.
- F. AWCI Technical Manual 12-B "Standard Practice for the Testing and Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide", Latest Edition.

1.5 SYSTEM DESCRIPTION

- A. The intumescent fire protection materials shall be applied at the required thickness to provide the UL fire resistive ratings.

1.6 SUBMITTALS

- A. Manufacturer's Data: Submit manufacturer's specifications, including independent laboratory physical property test reports and certifications as may be required to show material compliance with contract documents.

1.7 QUALITY ASSURANCE

- A. Comply with ASTM E2924 for the testing, labeling, transportation, delivery, storage, shelf life, application and inspection of intumescent coatings.
- B. Manufacturer - Company specializing in manufacturing fire protection products.
- C. The intumescent fire resistive material shall be manufactured under the Follow-Up Service program of UL or ULC and bear the UL and/or ULC label (mark).
- D. Applicator - A firm with expertise in the installation of fire resistive or similar materials.
- E. Product - The product shall be approved by the architect and applicable authorities having jurisdiction.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the project in manufacturer's unopened packages, fully identified as to trade name, type and other identifying data. Packaged materials shall bear the appropriate labels, seals and UL label (mark) for fire resistive ratings and shall be stored at temperatures in compliance with manufacturer instructions in a dry interior location away from direct sunlight.
- B. DO NOT FREEZE.

1.9 PROJECT/SITE CONDITIONS

- A. When the temperature at the job site is less than 50° F, a minimum substrate and ambient temperature of 50° F shall be maintained prior to, during, and a minimum of 72 hours after application. If necessary for job schedule, the General Contractor shall provide enclosures and heat to maintain proper temperatures and humidity levels in the application areas.
- B. In enclosed areas, ventilation shall not be less than 4 complete air exchanges per hour until the material is dry.
- C. Relative humidity shall not exceed 85% throughout the total period of application and drying for the intumescent fire resistive material, and must not exceed 85% throughout the application and drying for the protective decorative topcoat.

1.10 SEQUENCING AND SCHEDULING

- A. Applicator shall cooperate in the coordination and scheduling of fire protection work to avoid delays in job progress.
- B. The installation of piping, ducts, conduit or other suspended equipment shall not commence until the application of the thin-film fire resistive material is complete in that area.

PART 2 - PRODUCTS

2.1 COMPATIBLE METAL PRIMER

- A. Primer shall be approved by manufacturer and applied in full accordance with the primer manufacturer's written instructions.

2.2 INTUMESCENT FIRE PROTECTION SYSTEM

- A. The intumescent fire resistive material shall be CAFCO® SprayFilm® WB 5 ss supplied by ISOLATEK International or CAFCO INDUSTRIES or Sherwin Williams Firetex 5120..
- B. Intumescent fire resistive material shall be applied in accordance with drawings and/or specifications and shall have been tested in accordance with the procedures of ANSI/UL 263 or ASTM E119 or CAN/ULC-S101 and reported by Underwriters Laboratories, Inc. or Underwriters Laboratories of Canada only.

- C. Thin-Film Fire-Resistive Intumescent Mastic Coating: Factory-mixed formulation.
 - 1. Water-Based Formulation: Approved by manufacturer and authorities having jurisdiction for indicated use.
 - 2. Verify with manufacturer that products selected are suitable for use indicated.
 - 3. UL Fire Tested Designs Only based on ANSI/UL 263 (ASTM E119).
 - 4. Current Third Party Evaluation Service Report
 - 5. To assure an acceptable Architectural finish, no mesh is allowed.
 - 6. A representative mock-up sprayed Architectural finish sample must be submitted, reviewed, and accepted by the architect in advance.

2.3 DECORATIVE TOPCOATING

- A. Topcoat materials shall be required for color-coding, aesthetics or additional surface protection, approved by the thin-film fire resistive material manufacturer and applied in full accordance with the coating manufacturer's written instructions.

PART 3 - EXECUTION

3.1 PREPARATION

- A. All surfaces to receive thin-film fire resistive material shall be clean, dry and free of oil, grease, loose mill scale, dirt, dust or other materials which would impair bond of the thin-film fire resistive material to the surface. Any cleaning of the surfaces to receive fire resistive material shall be the responsibility of the General Contractor or steel erector, as outlined in the structural steel section.
- B. Confirm compatibility of surfaces to receive thin-film fire resistive material. Steel surfaces shall be primed with a compatible primer approved by the thin-film fire resistive material manufacturer.
- C. Provide masking, drop cloths or other suitable coverings to prevent overspray onto surfaces not intended to be coated with intumescent coating.

3.2 APPLICATION

- A. The thin-film fire resistive material shall be applied at the required dry film thickness per the appropriate UL design number guidelines and manufacturers written application instructions.

3.3 MOCK UP

- A. Before proceeding with the work, the applicator shall apply the thin-film fire resistive material to a section witnessed by the architect's or owner's representative. The application shall be subject to their approval and shall be used as a guide for texture and thickness of the finished work.

3.4 CLEAN UP AND REPAIR

- A. Upon completion of installation, all excess material, overspray and debris shall be cleared and removed from the job site.
- B. All patching of and repair to thin-film fire resistive material, due to damage by other trades, shall be performed under this section and paid for by the trade responsible for the damage. Patching shall be performed by an applicator with expertise in the installation of fire resistive or similar materials. Repair shall be in accordance with UL design number guidelines and manufacturers written application instructions.

3.5 INSPECTION AND TESTING

- A. In addition to continuous Wet Film Thickness checks performed by applicator during application, the installed intumescent material shall be inspected by a qualified independent testing laboratory for thickness in accordance with the AWCI Technical Manual 12-B "Standard Practice For The Testing and Inspection Of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide", Latest Edition, before application of the topcoat.
- B. The results of the above tests shall be made available to all parties at the completion of each area and approved prior to the application of topcoat.

END OF SECTION 07 81 20

SECTION 07 84 13 - 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. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.
- B. Related Sections include the following:
 - 1. Division 22 and 23 Sections specifying duct and piping penetrations.
 - 2. Division 26, 27, and 28 Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop 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 construction penetrated.
 - 1. Fire-resistance-rated walls.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:
 - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
 - 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - a. Penetrations located outside wall cavities.
 - b. Penetrations located outside fire-resistance-rated shaft enclosures.
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
 2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- C. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.
- D. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

- D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application in the Through-Penetration Firestop System Schedule at the end of Part 3 that are produced by one of the following manufacturers:
1. Nelson Firestop Products
 2. Hilti
 3. 3M

2.2 FIRESTOPPING, GENERAL

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/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. Substrate primers.
 3. Collars.
 4. Steel sleeves.

2.3 FILL MATERIALS

- A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
- B. 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.

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 work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system 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 through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. 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 through-penetration firestop 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 through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing 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 firestop systems.

- C. Install fill materials for firestop systems 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 Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
 1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Through-penetration firestop system manufacturer's name.
 6. Installer's name.

3.5 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system 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 through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.6 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Firestop Systems with No Penetrating Items:
 1. UL-Classified Systems: W-J- 0001, W-J-0003, W-J-0006

2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant
 - b. Silicone foam and sealant
 - c. Intumescent putty
 - d. Mortar

- C. Firestop Systems for Metallic Pipes, Conduit, or Tubing:
 1. UL-Classified Systems: W-K- 1001, W-K-4001
 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant
 - b. Silicone sealant
 - c. Intumescent putty
 - d. Mortar

- D. Firestop Systems for Nonmetallic Pipe, Conduit, or Tubing:
 1. UL-Classified Systems: W-J- 2005, W-J-2014, W-J-2023, W-J-43, W-J-2087
 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant
 - b. Silicone sealant
 - c. Intumescent putty

- E. Firestop Systems for Electrical Cables:
 1. UL-Classified Systems: W-J- 3007, W-J-3011, W-J-3037, S-J-3076.
 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant
 - b. Silicone sealant
 - c. Intumescent putty
 - d. Silicone foam

- F. Firestop Systems for Cable Trays:
 1. UL-Classified Systems: W-K- J-4022, W-J-4023.
 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant
 - b. Intumescent putty
 - c. Silicone foam
 - d. Mortar

- G. Firestop Systems for Insulated Pipes:
 1. UL-Classified Systems: W-J- 5006, W-J-5018, W-J-5051.
 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant

- b. Intumescent putty
 - c. Silicone foam
 - d. Intumescent wrap strips
- H. Firestop Systems for Miscellaneous Mechanical Penetrants: W-AJ-7009,
- 1. Type of Fill Materials: One or both of the following:
 - a. Latex sealant
 - b. Mortar
- I. Firestop Systems for Groupings of Penetrants:
- 1. UL-Classified Systems: W-J- 8001, W-J-8005, W-J-8023
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant
 - b. Mortar
 - c. Intumescent wrap strips

END OF SECTION 07 84 13

SECTION 07 84 46 - 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. This Section includes fire-resistive joint systems for the following:
 - 1. Floor-to-wall joints.
 - 2. Wall-to-wall joints.
- B. Related Sections include the following:
 - 1. Division 07 Section "Penetration Firestopping" for systems installed in openings in walls and floors with and without penetrating items.
 - 2. Division 07 Section "Joint Sealants" for non-fire-resistive joint sealants.

1.3 PERFORMANCE REQUIREMENTS

- A. General: 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 assembly in which fire-resistive joint systems are installed.
- B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities indicated as determined by UL 2079.
 - 1. Load-bearing capabilities as determined by evaluation during the time of test.
- C. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

- C. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.
- D. Qualification Data: For Installer.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- C. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.
 - 2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance Requirements" Article and comply with the following:
 - a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.
 - b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the fire-resistive joint systems indicated for each application in the Fire-Resistive Joint System Schedule at the end of Part 3.

2.2 FIRE-RESISTIVE JOINT SYSTEMS

- A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.
- B. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting 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 work.
 - 1. 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 Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.
- B. Install forming/packing/backing 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.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings and forming/packing/backing 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 Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as 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 openings 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.

3.5 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Designation System for Joints in or between Fire-Resistance-Rated Constructions: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHBN.
- B. Floor-to-Wall Fire-Resistive Joint Systems:
 - 1. UL-Classified Systems: FW
 - 2. Assembly Rating: 1 hour.
 - 3. Joint Width: As indicated.
- C. Wall-to-Wall Fire-Resistive Joint Systems:
 - 1. UL-Classified Systems: WW-D
 - 2. Assembly Rating: 1 hour
 - 3. Joint Width: As indicated
 - 4. Movement Capabilities: Class II - percent compression or extension.
- D. Head-of-Wall, Fire-Resistive Joint Firestopping Systems:
 - 1. UL-Classified Systems: HW-D.
 - 2. Assembly Rating: 1 hour
 - 3. Nominal Joint Width: As indicated
- E. Bottom-of-Wall, Joint Firestopping Systems:
 - 1. UL-Classified Systems: BW-D
 - 2. Assembly Rating: 1 hour
 - 3. Nominal Joint Width: As indicated

END OF SECTION 07 84 46

SECTION 07 92 00 - 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. Silicone joint sealants.
- 2. Acoustical joint sealants.
- 3. Acrylic latex joint sealants.

- B. Related Sections:

- 1. Division 09 Section "Gypsum Board" for sealing perimeter joints.
- 2. Division 09 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters with acoustical sealant

1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

- 1. Use ASTM C 1087 manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
- 2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
- 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
- 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
- 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to and compatibility with, joint substrates and other materials matching those submitted.

- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

- 1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.

2. Conduct field tests for each application indicated below:
 - a. Each kind of sealant and joint substrate indicated.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- 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.
- D. Qualification Data: For qualified Installer.
- E. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

- G. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- H. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- I. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 - 2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- D. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

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

1.7 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

- E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Multicomponent, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade P, Class 100/50, for Use T.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; FC Parking Structure Sealant.
 - b. May National Associates, Inc.; Bondaflex Sil 728 RCS.
- B. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following
 - a. Dow Corning Corporation; DOWSIL 790 and 795 Silicone Building Sealant
 - b. Pecora 890 nst

2.3 ACOUSTICAL JOINT SEALANTS

- A. 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. Pecora Corporation; AIS-919.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.

2.4 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: 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 Corporation; AC-20+.
 - b. Tremco Incorporated; Tremflex 834.

2.5 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are 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) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting 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 and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and

approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete
 - b. Masonry
 - c. Unglazed surfaces of ceramic tile
 - d. Exterior insulation and finish systems
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal
 - b. Glass
 - c. Porcelain enamel
 - d. 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 where indicated per Figure 8B in ASTM C 1193.
 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, 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.

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 and remove 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.
 - b. Tile control and expansion joints.
 - c. Joints between different materials listed above.
 2. Silicone Joint Sealant: Single component, Nonsag, Neutral curing.
 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. Construction joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints in exterior insulation and finish systems.
 - d. Joints between different materials listed above.
 - e. Perimeter joints between materials listed above and frames of doors, windows and louvers.
 - f. Control and expansion joints in ceilings.
 2. Silicone Joint Sealant: Single component, Nonsag, Neutral curing.
 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. Silicone Joint Sealant: Multicomponent, pourable, traffic grade, neutral curing.
 3. Joint-Sealant Color: Match Architect's sample.
- 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. Perimeter joints of exterior openings where indicated.
 - c. Vertical joints on exposed surfaces of interior unit masonry.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
 2. Joint Sealant: Acrylic based.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Sealant Location:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - 2. Joint Sealant: Single component, nonsag, mildew resistant, acid curing.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Location:
 - a. Acoustical joints where indicated and specified.
 - b. Other joints as indicated.
 - 2. Joint Sealant: Acoustical.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 07 92 00

SECTION 07 95 00.01 - EXTERIOR WALL EXPANSION JOINT SEALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preformed, precompressed, expanding foam joint seals for expansion joints in exterior walls.

B. Related Sections:

1. Division 01: Administrative, procedural, and temporary work requirements.
2. Section [07 92 00 - Joint Sealers.]

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:

1. Convene at Project site 2 weeks prior to beginning work of this Section.
2. Attendance: Architect, Contractor, Construction Manager, joint seal installer, and related trades
3. Review and discuss:
 - a. Joint seal manufacturer's requirements, project conditions, allowable structural movement at joints, and protection of completed work.
 - b. Transitions in plane and direction, and requirement for continuity of seal through watertight transitions from wall expansion joint to other interfacing expansion joint systems at adjacent construction.

1.3 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
 - a. Indicate joint locations, dimensions, and adjacent construction.
 - b. Provide details for transitions in plane and direction for continuity of seal through watertight transitions from wall expansion joint to other interfacing expansion joint systems at adjacent construction.
2. Product Data: Material description and application instructions.
3. Samples:
 - a. Minimum 2 x 2 inch joint seal samples showing available colors.
 - b. Minimum 6 inch long samples.

B. Informational Submittals:

1. Manufacturer's certification that:

- a. Products are capable of withstanding temperature of 150 degrees F for 3 hours while compressed to minimum of movement capability dimension without evidence of bleeding of impregnation medium from material.
- b. Same material after heat stability test and after cooling to room temperature will self-expand to maximum of movement capability dimension within 24 hours at 68 degrees F.

C. Sustainable Design Submittals: Refer to Division 01.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Minimum 10 years experience in production of specified materials.

B. Installer Qualifications: Minimum 2 years experience in work of this Section.

1.5 DELIVERY, STORAGE AND HANDLING

A. In accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Contract Documents are based on products by Sika Emseal, 800-526-8365, www.emseal.com.

2.2 MATERIALS

A. Exterior Wall Expansion Joint Seal:

1. Source: Seismic Colorseal by Sika Emseal.
2. Description: Silicone coated, ultraviolet resistant, watertight, primary wall seal with factory-applied adhesive on one side.
3. Form: Precompressed to less than nominal material size for installation into designed joint size equal to material nominal size.
4. Movement capability: Plus and minus 50% (total 100%) of nominal material size.
5. R-value: 2.15 per inch depth at nominal joint size compression, tested to ASTM C518.
6. STC rating: 52 in STC 56 wall, tested to ASTM E90.
7. OITC rating: 38 in OITC 38 wall, tested to ASTM E90.

8. Air permeability: Maximum 0.02 liter per second per square meter, tested to ASTM E283 at 75 Pa.
9. Water penetration: No water penetration, tested to ASTM E331 at 5000 Pa test pressure.
10. Wind loading:
 - a. 0.1 mm net deflection, tested to ASTM E330 at 2730 Pa or 150 MPH wind.
 - b. 0.6 mm net deflection, tested to ASTM E330 at 4854 Pa or 200 MPH wind.
11. Weathering: Sealing of outside wall joints per DIN 18542-1999 / G155-2013: Pass
12. VOC Emissions: CDPH-1.2-2017: Pass
13. Color: To be selected from Sika Emseal full color range.
14. Silicone: Field applied corner bead at face of seal to substrate interface, furnished by joint seal manufacturer, in same material and color as used in factory coating.
 - a. Abrasion Resistance: Less than 1% weight loss, tested to ASTM D4060
 - b. Fuel Resistance: Pass, tested to ASTM C719/C1135

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean joints thoroughly; remove loose and foreign matter that could impair adhesion or performance.

3.2 INSTALLATION

- A. Install joint seal in accordance with Sika Emseal instructions and approved Shop Drawings.
- B. Remove joint seal from precompressed packaging, immediately insert into joint, and allow to expand.
- C. Use temporary retainers if required to maintain joint seals in position until expansion is complete.

END OF SECTION 07 95 00.01

SECTION 07 95 00.02 - INTERIOR WALL AND CEILING EXPANSION CONTROL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The work shall consist of furnishing and installing expansion joints in accordance with the details shown on the plans and the requirements of the specifications. The joints are proprietary designs utilizing preformed metal components and gaskets.
- B. Related Work
 - 1. Gypsum Board
 - 2. Miscellaneous and ornamental metals
 - 3. Flashing and sheet metal
 - 4. Sealants and caulking

1.2 SUBMITTALS

- A. Template Drawings - Submit typical seismic joint cross-section(s) indicating pertinent dimensioning, general construction, component connections, and anchorage methods.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver products in each manufacturer's original, intact, labeled containers and store under cover in a dry location until installed. Store off the ground, protect from weather and construction activities.

1.4 ACCEPTABLE MANUFACTURER

- A. Basis of Design: All joints shall be as manufactured/supplied by Sika Emseal, 25 Bridle Lane, Westborough, MA 01581 USA.
- B. Alternate manufacturers and their products will be considered, provided they meet the design concept and are produced of materials that are equal to or superior to those called for in the base product specification.

1.5 QUALITY ASSURANCE

- A. Warranty: Standard material limited warranty or project specific warranty available. Installation shall be in strict accordance with manufacturer's technical specifications, details, installation instructions and general procedures in effect for normal intended usage and suitable applications under specific design movements and loading conditions.
- B. Manufacturer: Shall have a minimum ten (10) years experience specializing in the design and manufacture of Architectural Expansion Control Systems

- C. Application: Minimum 2 years [documented] experience in work of this Section

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide wall and ceiling expansion control system that accommodates multi-directional movement. The system shall be capable of following changes in direction utilizing preformed or extruded metal profiles and integral snap-fit features for ease of component assembly.
 - 1. For walls, ceilings and soffits furnish Wabo[®]Contour II Expansion Control System, Model “CTR” as manufactured by Sika Emseal. and as indicated on drawings.

2.2 COMPONENTS AND MATERIALS

- A. Exposed Upper Face Component:
 - 1. Material shall be extruded aluminum confirming to properties of ASTM B221 alloy 6063-T5.
- B. Lower Base Component:
 - 1. Material shall be extruded aluminum confirming to properties of ASTM B221 alloy 6063-T5.
- C. Slide Plate:
 - 1. Extruded Profiles: Material shall be extruded aluminum confirming to properties of ASTM B221 alloy 6063-T5.
 - 2. Manufactured Profiles: Material shall be aluminum conforming to the properties of ASTM B209, alloy 5005-H34.
- D. Isolation Gasket - Material shall be manufacturers standard polyvinylchloride extruded profile.
- E. Anchors - Installing contractor to provide and utilize drywall screws appropriate for the wall studs. At corner condition secure slide plte to wallProvide No. 10 diameter. x 1-1/2 inch long Phillips drive panhead self-drilling TEK screw. Maximum spacing shall be 18” o.c.
- F. Accessories - Provide necessary and related parts required for complete installation.

2.3 FABRICATION

- A. Metal components with slide gasket and fastening system shall be shipped in 10 ft. lengths and shall be cut to length on jobsite where required. Components shall be miter cut in the field to conform to directional changes unless otherwise contracted with expansion joint manufacturer.
- B. Anchor holes at lower edge component shall be field drilled in accordance with manufacturer’s drawings.

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- C. Fire Barriers - Ship manufacturer's standard assembly including fire caulks, sealants (if applicable) and hardware for the required hourly rating. Assemblies shall be miter cut in the field to accommodate changes in direction.

2.4 FINISHES

A. Exposed Upper Edge Component and Slide Plate

- 1. Aluminum Standard: - clear anodized finish in accordance with AA-M10 C22 A31 Class II (0.4 - 0.7 thick anodic coating).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Protect all expansion joint component parts from damage during installation and placement of wall or ceiling materials and thereafter until completion of structure.
- B. Expansion joint systems shall be installed in strict accordance with the manufacturer's typical details and instructions along with the advice of their qualified representative.
- C. Expansion joint systems shall be set to the proper width for the ambient temperature at the time of installation. This information is indicated in the contract plans.

3.2 CLEAN AND INSPECT

- A. Upon completing installation the contractor shall clean all exposed metal surfaces with a suitable cleaner that will not harm or attack the finish. Contact manufacturer should questions arise regarding suitability of any cleaner type prior to its use.

END OF SECTION 07 95 00.02

SECTION 07 95 00.03 - INTERIOR FLOOR HORIZONTAL EXPANSION CONTROL SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The work shall consist of furnishing and installing expansion joints in accordance with the details shown on the plans and the requirements of the specifications. The joints are proprietary designs utilizing aluminum plate profiles.
- B. Related Work
 - 1. Cast-in-place concrete
 - 2. Miscellaneous and ornamental metals
 - 3. Flashing and sheet metal

1.2 SUBMITTALS

- A. Template Drawings - Submit typical joint cross-section(s) indicating pertinent dimensioning, general construction, component connections, and anchorage methods.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver products in each manufacturer's original, intact, labeled containers and store under cover in a dry location until installed. Store off the ground, protect from weather and construction activities.

1.4 ACCEPTABLE MANUFACTURER

- A. Basis of Design: All joints shall be manufactured/supplied by Sika Emseal, 25 Bridle Lane, Westborough, MA 01581 USA.
- B. Alternate manufacturers and their products will be considered, provided they meet the design concept and are produced of materials that are equal to or superior to those called for in the base product specification.

1.5 QUALITY ASSURANCE

- A. Warranty: Standard material limited warranty or project specific warranty available. Installation shall be in strict accordance with manufacturer's technical specifications, details, installation instructions and general procedures in effect for normal intended usage and suitable applications under specific design movements and loading conditions.
- B. Manufacturer: Shall have a minimum of ten (10) years experience specializing in the design and manufacture of Architectural Expansion Control Systems

- C. Application: Minimum 2 years experience in work of this Section

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide floor joint cover consisting of metal profiles that utilize various metal finishes designed of width and thickness required to satisfy projects movement and loading requirements. Secure cover plate to concrete floor slab by utilizing manufacturer's recommended anchoring system. Furnish Wabo® FastFloor, Model(s) "FJF", "FJS" meeting ADA guidelines for interior joint locations as manufactured by Sika Emseal and as indicated on drawings. Select Model based on requirements.

2.2 COMPONENTS AND MATERIALS

- A. Aluminum Shapes - Material to conform to ASTM B209, alloy 6061-T6 (flush floor).
- B. Moisture Barrier (optional) - Shall be a fabric reinforced tear resistant clear vinyl sheet material. Minimum thickness shall be .026".
- C. Anchorage - Provide minimum 1/4" diameter concrete expansion anchor at maximum 18" o.c. spacing to secure aluminum cover to floor slab.
- D. Accessories - Provide necessary and related parts, and fasteners required for complete installation.
- E. Fire Barrier Assembly - Designed to provide the required fire endurance rating, minimize passage of smoke and accommodate dynamic movement without stress or degradation to its components. Test system in maximum joint width incorporating a field splice in accordance with UL-2079. Supply Sika Emseal Emshield® DFR2 (1-2-hour) , or Wabo®FireFlex (up to 20" wide and 2-hour fire rating) Fire Barrier Blanket System as governed by joint opening, test requirements and fire rating.
- F. Concrete Slab Repair (recommended) – Utilize a single component rapid strength repair mortar.

2.3 FABRICATION

- A. All profiles to be shipped in standard 10 ft. lengths and shall be cut to length on jobsite where required. Profiles shall be miter cut in the field to conform to directional changes unless otherwise contracted with expansion joint manufacturer.
- B. Fire Barriers - Ship manufacturer's standard assembly including fire caulks, sealants (if applicable) and hardware for the required hourly rating. Assemblies shall be miter cut in the field to accommodate changes in direction.

2.4 FINISHES (STANDARD)

- A. The cover plate's exposed surface shall receive a 60 grit brushed finish. All other aluminum shapes shall be supplied in standard mill finish.
- B. Surfaces of aluminum profiles that will be in direct contact with concrete where moisture is present shall receive one coat of manufacturer's recommended coating

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Protect all expansion joint component parts from damage during installation, placement of concrete and thereafter until completion of structure.
- B. Expansion joint systems shall be installed in strict accordance with the manufacturer's typical details and instructions along with the advice of their qualified representative.
- C. Expansion joint systems shall be set to the proper width for the ambient temperature at the time of installation. This information is indicated in the contract plans.

3.2 CLEAN AND PROTECT

- A. Protect system and its components during construction. After work is complete in adjacent areas clean exposed surfaces with a suitable cleaner that will not harm or attack the finish.

END OF SECTION 07 95 00.03

SECTION 08 11 13 - 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:

- 1. Standard hollow metal doors and frames.

B. Related Sections:

- 1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
- 2. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
- 3. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
- 4. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.
- C. Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI/NAAMM-HMMA 861.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door design including cut-outs for glazing and louvers.
 - 2. Details of doors, including vertical and horizontal edge details core material and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware and hardware type.

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.
10. Fire label.

C. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
2. For the following items, prepared on Samples about 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
 - a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
 - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.

D. Other Action Submittals:

1. 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 door hardware schedule.

E. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies 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.

1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are 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. Label each individual glazed lite.

D. ASTM E152 – Methods of Fire Tests of door assemblies.

- E. UL 10B – Fire Tests of door assemblies.
- F. UL 10C – Standard for Positive Pressure Fire Tests of door assemblies.
- G. SD1-100 – Standard Steel Doors and Frames.
- H. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to finish of 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 under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

- A. Coordinate installation of anchorages 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Item Description

Approved Manufacturers and Product Catalog Series

Hollow Metal Frames:	Curries CECO Steelcraft	M Series SU Series MU Series
Hollow Metal Doors:	Curries CECO Steelcraft	707 Series 747 Series CurriStain Series Legion Series Medallion Series Madera Series L Series B Series

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 366, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Galvanized Steel Sheet: ASTM A 525, Commercial Steel (CS), General requirements for steel sheet, zinc-coated (galvanized) by the Hot Dip process. ASTM A526 steel sheet, zinc coated (galvanized) by the hot-dip process, commercial quality.
- C. Frame Anchors: ASTM A 591, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011, hot-dip galvanized according to ASTM A 153, Class B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.
- E. Powder-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.
- F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143.
- G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- H. Glazing: Comply with requirements in Division 08 Section "Glazing."
- I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
1. Design: Flush panel.
 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 4.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
 - 1) Locations: Exterior doors.
 3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.
 - a. Beveled Edge: 1/8 inch in 2 inches.
 4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
 5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
 6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from A 60 galvanized, 16 gauge steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2, Seamless.
 2. Insulated.
- C. Interior Doors: Face sheets fabricated from 18 gauge cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Fire Rated Doors: Provide metal label indicating rating designation.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from A60 galvanized.
 - 1. Fabricate frames as full profile welded unless otherwise indicated.
 - 2. Frames for Level 2 Steel Doors: 14 gauge.
- C. Interior Frames: Fabricated from cold-rolled steel sheet.
 - 1. Fabricate frames as full profile welded unless otherwise indicated.
 - 2. Frames for Level 2 Steel Doors: 16 gauge up to 4'-0" wide.
 - 3. Frames for Wood Doors: 16 gauge min.
 - 4. Frames for Borrowed Lights: Same as adjacent door frame.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.
 - 1. Door and Frame Mortises and Reinforcement
 - a. Doors shall be internally reinforced for surface mounted hardware and cut-out, drilled and tapped to receive mortised hardware.
 - b. Reinforce all frames for regular arm and parallel arm surface mounted closers.
 - c. Reinforce frames for surface mounted hardware and cut-out, drilled and tapped to receive mortised hardware.

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 thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.0598 inch thick.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, 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 height adjustment. Terminate bottom of frames at finish floor surface.

2.6 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.
- D. Cover Plates: For hinge and strike plate cutouts, provide fully enclosed pressed steel cover boxes spot welded to frame behind mortises.

2.7 LOUVERS

- A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
 - 1. Sight proof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch wide steel.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.9 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. 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. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117. Maintain a maximum diagonal distortion of 1/16" from corner to corner.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 2. Glazed Lites: Factory cut openings in doors.
 - 3. 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 beyond edge of door on which astragal is mounted.

- D. 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. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Sidelight, Borrowed Lite 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.
 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 6. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 7. Door Silencers: Except on weather-stripped doors, where stop does not occur and openings with smoke gaskets, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.
- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered 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 type of glazing and type of installation indicated.
- H. Electrified Openings – Doors and Frames shall be pre-wired with sufficient number of concealed wires to accommodate electric functions of specified hardware. Provide Molex type standardized plug in connectors to accommodate up to twelve wires.

2.10 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A224.1 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure. Field paint (finish coat) as noted in Finish Schedule.
 2. Frame Finish: Clean frames by degreasing process and apply thorough coating of bake-on-primer, covering inside as well as outside surfaces. At galvanealed frames, coat welds and other disrupted surface with zinc-rich paint containing not less than 90 percent zinc dust by weight.

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. For the record, 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. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. 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 ANSI/SDI A250.11 and HMMA 840-99, Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.
 - 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-protection-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 glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that are 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 powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
 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, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Glazing: Comply with installation requirements in Division 08 Section "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 o.c. and not more than 2 inches 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. Adjust hardware for smooth and balanced door operation.
- 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.

END OF SECTION 08 11 13

SECTION 08 11 16 - FIRE-RATED ALUMINUM FULL VISION DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fire-rated aluminum full vision Aluflam door system including pre-finished door, frame, glazing, and hardware.

1.2 RELATED SECTIONS

- A. Section 08 71 00: Door Hardware.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):

- 1. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
- 2. ASTM E2074 Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.

- B. National Fire Protection Association (NFPA):

- 1. NFPA 80: Standard for Fire Doors and Fire Windows.
- 2. NFPA 251: Standard Methods of Tests of Fire Endurance of Building Construction and Materials.
- 3. NFPA 252: Standard Methods of Fire Tests of Door Assemblies.

- C. Uniform Building Code (UBC):

- 1. UBC-7-2: Methods for Fire Tests of Door Assemblies.

- D. Underwriters Laboratories, Inc. (UL):

- 1. UL 10C: Positive Pressure Fire Tests of Door Assemblies.

- E. American National Standards Institute (ANSI):

- 1. ANSI Z97.1 Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.

- F. Consumer Product Safety Commission (CPSC):

- 1. CPSC 16 CFR 1201 Categories I and II: Safety Standard for Glazing Materials.

1.4 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Fire Rating: 120 minutes Sidelites and Punched openings, 90 minutes Doors.
2. Certification: Doors and frames shall be tested in accordance with ASTM E 2074, NFPA 252, UBC 7-2, UL 10C, CAN4-S104.
3. Testing Laboratory: Fire tests shall be conducted by an approved independent testing laboratory, similar to Underwriter's Laboratories, Inc.

1.5 SUBMITTALS

A. Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedure Section.

1. Shop Drawings: Submit shop drawings showing layouts, profiles and product components.
2. Samples: Submit samples for finishes, colors and textures.
3. Technical Information: Submit latest edition of manufacturer's product data providing product description, technical data and installation instructions.

1.6 QUALITY ASSURANCE

A. Listings and Labels:

1. Fire rated framing and glazing shall be under current follow-up services by an approved independent agency and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

1.7 DELIVERY, STORAGE AND HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Delivery: Deliver materials to specified destination in manufacturer's packaging undamaged, complete with installation instructions.

C. Storage and Protection: Store off ground, under cover, protected from weather, direct sunlight, construction activities and at temperature conditions recommended by manufacturer, +10°F to +110°F.

D. Handling: Protect materials and finish during handling and installation to prevent damage.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual measurements for openings by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

PART 2 - PRODUCTS

2.1 FIRE-RATED ALUMINUM FULL VISION DOORS AND FRAMES

- A. Manufacturer: Aluflam North America (Basis of Design)
 - 1. Contact: 16604 Edwards Road, Cerritos, CA 90703: Telephone 562.926.9520
 Fax 562.404.1394. E-mail: info@aluflam-usa.com Website: www.aluflam-usa.com
 or local representative (www.aluflam-usa.com/contact/representatives.php).

2.2 MATERIALS – ALUMINUM FRAMING

- A. Frame construction: Integral structure and glazing stops from extruded and thermally broken aluminum profiles. Filled internally with cement composite material.
- B. Dimensions:
 - 1. Door framing face dimension: 2-1/2 inch
 - 2. Depth of door framing: 3-7/16 inch (3-5/8 for 90 Min Door)
 - 3. Door stile face dimension: 3-9/16 inch (3-3/4 for (90 Min Door)
 - 4. Door cross rail (if applicable): 3-9/16 inch (N/A for 90 Min Door)
- C. Assembly: Frame corners assembled by means of crimped and bonded miter joints.
- D. Sealing: Framing system shall insulate against effects of fire, smoke, and heat transfer from either side. Perimeter of the framing system to the rough opening shall be firmly packed with mineral wool insulation.
- E. Punched Openings:
 - 1. Frame construction: Integral structure, pressure plate, and cap from extruded aluminum profiles. Filled internally with cement composite material.
 - 2. Dimensions:
 - a. Perimeter framing face dimension: 2-3/8 inch
 - b. Depth of vertical framing: 6-1/4 inch
 - c. Depth of horizontal framing: 6-1/8 inch
- F. Assembly: Frame corners assembled with mechanical fasteners – in factory or in the field.
- G. Sealing: Framing system shall insulate against effects of fire, smoke, and heat transfer from either side. Perimeter of the framing system to the rough opening shall be firmly packed with mineral wool insulation.

2.3 MATERIALS – FIRE RESISTANT GLAZING

- A. Assemblies shall be glazed with 90 minute rated 1-3/8 inch thick SGG Contraflam 90 & 120 minute rated 1-9/16” inch thick fire resistant glazing material as manufactured by Vetrotech Saint-Gobain (www.vetrotechusa.com).
 - 1. Individual lites shall be permanently identified with a listing mark.
 - 2. Glazing material installed in “Hazardous Locations” (subject to human impact) shall be certified to meet the applicable requirements for fire rated assemblies referenced in ANSI Z97.1 Standard for Safety Glazing Materials Used In Buildings and/or CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.
 - 3. Visible daylight transmission shall be a minimum of 81%. Glazing material shall be optically clear, colorless and free from unusual distortion.

2.4 MATERIALS – GLAZING AND ASSEMBLY ACCESSORIES

- A. Fasteners: All fasteners, setting pads, and glazing clips, shall be stainless or zinc-plated steel.
- B. Glazing Accessories: The glazing material perimeter shall be separated from the perimeter framing system with approved flame retardant intumescent glazing tape. Ceramic setting blocks shall be placed between the metal setting pads and the glazing material. Setting pads and blocks provided by manufacturer.

2.5 FABRICATION

- A. Door frames and door leaves shall be furnished pre-assembled. Door assemblies shall be field glazed.
- B. Door assemblies shall be factory prepared for field mounting of hardware.
- C. Fabrication Dimensions: Fabricate to approved dimensions. The general contractor shall guarantee dimensions within required tolerance (+ - 1/8”). Obtain approved shop drawings prior to fabrication.

2.6 FINISHES

- A. Framing shall be chemically cleaned and pretreated, then finished on all exposed areas with: Clear Anodized
- B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Slight variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

2.7 DOOR HARDWARE

- A. Refer to Door Hardware Specification set 14 & 15.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine area to receive doors. Openings shall be plumb, square and within allowable tolerances. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Door installation shall be by a specialty contractor with appropriate experience qualifications; and in strict accordance with the approved shop drawings.

3.3 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Glass and frame should be cleaned using soft clean cloth, chamois leathers, sponges or soft paper. Use clean warm water with a mild detergent. Do not use detergent that contains either alkaline, acids or fluoride! Abrasive cleaning methods can damage surfaces! Clean prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 08 11 16

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior Flush Wood Veneer Doors:
 - 1. Five-ply flush bonded doors.
 - 2. Flush fire-rated wood doors.

1.2 RELATED SECTIONS

- A. Section 08 12 00 – Metal Frames
- B. Section 08 71 00 – Door Hardware
- C. Section 08 80 00 – Glazing

1.3 REFERENCES

- A. AWI/AWMAC/WI Architectural Woodwork Standards, Edition 1, Section 9 – Doors.
- B. NFPA 80 – Standard for Fire Doors and Other Opening Protectives.
- C. UL 10C – Positive Pressure Fire Tests of Door Assemblies.
- D. WDMA Finish System TR-8, UV Cured Acrylated Polyester/Urethanes.
- E. WDMA I.S. 1A-11 – Architectural Wood Flush Doors.

1.4 SUBMITTALS

- A. Comply with Section 01 33 00 – Submittal Procedures.
- B. Product Data: Submit manufacturer's product data, including door construction description and WDMA I.S.1-A and AWS classifications.
- C. Schedules: Submit manufacturer's schedules, including door dimensions, cutouts, species, finish, and hardware. Reference individual door numbers as indicated on the Drawings.
- D. Samples: Submit manufacturer's door finish samples.
- E. Cleaning Instructions: Submit manufacturer's cleaning instructions for doors.
- F. Warranty: Submit manufacturer's standard warranty.

1.5 QUALITY ASSURANCE

- A. Tolerances for Warp, Telegraphing, Squareness, and Prefitting Dimensions: WDMA I.S.1-A
- B. Identifying Label: Each door shall bear identifying label indicating:
 - 1. Door manufacturer
 - 2. Order number
 - 3. Door number
 - 4. Fire rating, if applicable
- C. Fire-Rated Doors:
 - 1. Labeled by qualified testing agency
 - 2. Construction Details and Hardware Application: Approved by labeling agency.
 - 3. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
- D. Positive Pressure Opening Assemblies: UL 10C.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
 - 1. Deliver doors to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
 - 2. Package doors individually in polybags.
- B. Storage:
 - 1. Store doors in accordance with manufacturer's instructions.
 - 2. Store doors in clean, dry area indoors, protected from damage and direct sunlight.
 - 3. Store doors flat on level surface.
 - 4. Do not store doors directly on concrete.
 - 5. Keep doors completely covered. Use covering which allows air circulation and does not permit light to penetrate.
 - 6. Store doors between 50 and 90 degrees F and 25 to 55 percent relative humidity.
- C. Handling:
 - 1. Handle doors in accordance with manufacturer's instructions.
 - 2. Protect doors and finish during handling and installation to prevent damage.
 - 3. Handle doors with clean hands or clean gloves.
 - 4. Lift and carry doors. Do not drag doors across other doors or surfaces.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not subject doors to extreme conditions or changes in temperature or relative humidity in accordance with WDMA I.S.1-A.

1.8 WARRANTY

- A. Warrant solid core, interior doors for life of installation against warpage, delamination, and defects in materials and workmanship.
- B. Defects noted during warranty period shall be corrected at no cost to Owner. Corrective work shall include labor and material for repair, replacement, refinishing, and rehangng as required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. VT Industries, Inc., - Heritage Collection. 1000 Industrial Park, PO Box 490, Holstein, Iowa 51025. Toll Free (800) 827-1615. Phone (712) 368-4381. Fax (712) 368-4111. www.vtindustries.com. door_info@vtindustries.com.
- B. VT Industries, Inc. – Heritage Collection. 164 North Lake Street, Neenah, WI 54956. Phone (920) 722.6444. www.vtindustries.com. door_info@vtindustries.com.
- C. Masonite Architectural - Aspiro Series

2.2 GENERAL

- A. Glass Mouldings:
 - 1. Non-rated Flush Doors: VT Industries Style VT1.
 - 2. Fire-Rated Doors: VT Industries Style 110, steel vision frame, beige prime finish.
- B. Glazing: As specified in Section 08 80 00.

2.3 FIVE-PLY FLUSH BONDED DOORS

- A. Five-Ply Flush Bonded Doors: Heritage Collection.
 - 1. Compliance: WDMA I.S.1-A.
 - a. Aesthetic Grade: Custom
 - b. Duty Level: Extra heavy duty
 - c. Type: SCLC-5
 - 2. Seven-Ply and Non-Bonded Core Construction: Not acceptable.
 - 3. Door Thickness: 1-3/4 inches.
 - 4. Stiles:
 - a. Structural Composite Lumber (SCL) With Wood or Veneer Edge: Compatible species as face veneer.

5. Rails:
 - a. Structural composite lumber (SCL). Factory Sealed.
6. Core:
 - a. Material: Structural composite lumber (SCL)
7. Door Assembly:
 - a. Stiles and Rails: Bonded to core.
 - b. Sand entire assembly flat as a unit to ensure minimal telegraphing of core components through face veneers.
8. Composite Crossbands:
 - a. Apply to core in hot press using Type I, exterior, water-resistant adhesive
9. Veneers:
 - a. Apply to crossbanded core in hot press using Type I, exterior, water-resistant adhesive.
 - b. Species: WHITE OAK
 - c. Cut: Plain sliced
 - d. Match: Book.
 - e. Assembly: Running.
 - f. Minimum Thickness Before Sanding: 1/42 inch.

2.4 FLUSH FIRE-RATED WOOD DOORS

A. Flush Fire-Rated Wood Doors: Heritage Collection.

1. Compliance: WDMA I.S.1-A.
 - a. Aesthetic Grade: Custom
 - b. Duty Level: Extra heavy duty
 - c. Type: Core complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Seven-Ply and Non-Bonded Core Construction: Not acceptable.
3. Door Thickness: 1-3/4 inches.
4. Outer Edges: Compatible species as face veneer.
5. Stiles: Manufacturer's standard for fire-protection rating indicated
6. Rails:
 - a. Manufacturer's standard for fire-protection rating indicated
 - b. Width: Manufacturer's standard width.
7. Core:
 - a. Manufacture's standard for fire-protection rating indicated

8. Composite Crossbands:
 - a. Apply to core in hot press using Type I, exterior, water-resistant adhesive before application of hardwood edges.
9. Veneers:
 - a. Apply to crossbanded core in hot press using Type I, exterior, water-resistant adhesive.
 - b. Species: WHITE OAK
 - c. Cut: Plain sliced
 - d. Match: Book.
 - e. Assembly: Running.
 - f. Minimum Thickness Before Sanding: 1/42 inch.
10. Positive Pressure:
 - a. Where UBC 7-2-1997/UL 10C standards for positive pressure apply, doors shall be constructed in accordance with Category A guidelines as published by Intertek/Warnock Hersey.
 - b. Smoke Gasketing: Apply smoke gasketing around frame perimeter and between door and pairs to meet Smoke (S) rating.
 - c. Intertek/Warnock Hersey Category A Guidelines: Edge sealing systems not allowed on frames.

2.5 FABRICATION

- A. Prefit Doors:
 1. Prefit and bevel doors at factory to fit openings.
 2. Prefit Tolerances: WDMA I.S.1-A
- B. Factory-machine doors for mortised hardware, including pilot holes for hinge screws and lock fronts required.

2.6 FINISHES

- A. Doors shall receive factory finishing.
- B. Factory Finishing: WDMA System TR-8, UV Cured Acrylated Polyester/Urethanes)
- C. Stain Color: To be selected from standard finish samples.
- D. Top and Bottom Rails: Factory sealed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine locations to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not begin installation until unacceptable conditions are corrected.
- B. Ensure frames are solidly anchored, allowing no deflection when doors are installed.

- C. Ensure frames are plumb, level, square and within tolerance.

3.2 PREPARATION

- A. Allow doors to become acclimated to building temperature and relative humidity for a minimum of 24 hours before installation.

3.3 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors at locations indicated on the Door Schedule/Drawings.
- C. Install doors plumb, level and square.
- D. Install door hardware as specified in Section 08 71 00.

3.4 ADJUSTING

- A. Adjust doors to swing freely, without binding in frame.
- B. Adjust hardware to operate properly.
- C. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- D. Remove and replace damaged doors that cannot be successfully repaired, as determined by Architect.

3.5 CLEANING

- A. Clean doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage finish.

3.6 PROTECTION

- A. Protect installed doors from damage during construction.

END OF SECTION 08 14 16

SECTION 08 17 43 - SL SERIES FIRE RATED FRP DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. SL-17FR Pebble Grain Fire-Rated Fiberglass Door.
- B. SL-17FR Pebble Grain Fire-Rated Fiberglass Door in Fire-Rated Metal Frame.
- C. SL-17FR Pebble Grain Fire-Rated Fiberglass Door in Fire-Rated Fiberglass Frame.

1.2 RELATED SECTIONS

- A. Section 04 00 00 – Masonry Mortar.
- B. Section 05 50 00 – Metal Fabrications.
- C. Section 08 01 17 – Operation and Maintenance of Integrated Door Opening Assemblies.
- D. Section 08 06 71 – Door Hardware Schedule.
- E. Section 08 06 80 – Glazing Schedule.
- F. Section 08 10 00 – Doors and Frames.
- G. Section 08 71 00 – Door Hardware.
- H. Section 08 80 00 – Glazing.

1.3 REFERENCES

- A. ASTM-D256 – Standard Test Methods for Determining the Pendulum Impact Resistance of Plastics.
- B. ASTM-D570 – Standard Test Method for Water Absorption of Plastics.
- C. ASTM-D638 – Standard Test Method for Tensile Properties of Plastics.
- D. ASTM-D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- E. ASTM-D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
- F. ASTM D2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

- G. ASTM-E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. CAN / ULC S104 – Standard Method for Fire Tests of Door Assemblies.
- I. UL 10B – Standard for Fire Tests of Door Assemblies.
- J. UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies.
- K. NFPA 80 – Standard for Fire Doors and Other Opening Protectives.
- L. NFPA 252 – Fire Tests of Door Assemblies.

1.4 SUBMITTALS

- A. Must comply with Section 01 33 00 – Submittal Procedures.
- B. Action Submittals/ Informational Submittals.
 - 1. Product Data
 - a. Submit manufacturer’s product data sheets, catalog pages illustrating the products, description of materials, components, fabrication, finishes, installation instructions, and applicable test reports.
 - 2. Shop Drawings
 - a. Submit manufacturer’s shop drawings, including elevations, sections, and details indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
 - 3. Samples.
 - a. Submit manufacturer’s door sample composed of door face sheet, core, framing and finish.
 - b. Submit manufacturer’s sample of standard colors for door face and frame.
 - 4. Testing and Evaluation Reports.
 - a. Submit testing reports and evaluations provided by manufacturer conducted by and accredited independent testing agency certifying doors and frames comply with specified performance requirements listed in Section 2.01 C.
 - 5. Manufacturer Reports.
 - a. Manufacturer’s Project References.
 - 1) Submit list of successfully completed projects including project name, location, name of architect, type, and quantity of doors manufactured.
- C. Closeout Submittals.

1. Operation and Maintenance Manual.
 - a. Submit manufacturer's maintenance and cleaning instructions for doors and frames, including maintenance and operating instructions for hardware.
2. Warranty Documentation.
 - a. Submit manufacturer's standard warranty.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications.

1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years concurrent successful experience.
2. Door and frame components must be fabricated by same manufacturer.
3. Evidence of a documented complaint resolution quality management system.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Deliver materials to site in manufacturer's original, unopened, containers and packaging.
2. Labels clearly identifying opening, door mark, and manufacturer.

B. Storage

1. Store materials in a clean, dry area, indoors in accordance with manufacturer's instructions.

C. Handling

1. Protect materials and finish from damage during handling and installation.

1.7 WARRANTY

- A. Warrant doors, frames, and factory installed hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.
- B. Standard Period.
 1. Ten years starting on date of shipment.
- C. Limited lifetime

1. Covers failure of corner joinery, core deterioration, and delamination or bubbling of door skin and corrosion of all-fiberglass products while the door is in its specified application in its original installation.

D. Finish

1. Through color with SpecLite 3® integral surfaseal film FRP sheet: 10 years.
2. Painted SL-17FR face sheets: 5 years.
3. Painted FR frames: 3 years.

PART 2 - PRODUCTS

2.1 FRP/ALUMINUM HYBRID DOORS

A. Manufacturer.

1. Special-Lite, Inc.
PO Box 6, Decatur, Michigan 49045.
Toll Free (800) 821-6531, Phone (269) 423-7068, Fax (800) 423-7610.
Web Site www.special-lite.com.
E-Mail info@special-lite.com.

2.3 DESCRIPTION

A. SL-17FR Pebble Grain Fire-Rated Fiberglass Door.

1. Rated for 20 to 90 min maximum duration.
2. Door Opening Size.
 - a. 4'0" x 8'0" maximum size single swing.
 - b. 8'0" x 8'0" maximum size standard pairs.
3. Construction.
 - a. Door Thickness.
 - 1) 1-7/8" at door edge.
 - b. Stiles.
 - 1) Single Swing.
 - a) Hinge and lock stile, 2" minimum tectonite.
 - 2) Standard Pairs.
 - a) Hinge stile, 2" minimum tectonite.
 - b) Meeting edge, 3" minimum.
 - c. Rails.
 - 1) Top rail, 6" minimum tectonite.

- 2) Bottom rail, 4” minimum for single swing, 4-1/2” minimum for pairs tectonite.
- d. Core.
 - 1) WSCP-412 proprietary mineral core.
 - 2) 1-1/2” nominal thickness.
 - 3) 18 pcf minimum density.
- e. Face Sheet.
 - 1) Exterior
 - a) 0.120” thick, pebble texture, through color with SpecLite 3® integral surfaseal film FRP sheet.
 - b) Optional painted finish consult manufacturer.
 - c) Class C standard.
 - 2) Interior
 - a) 0.120” thick, pebble texture, through color with SpecLite 3® integral surfaseal film FRP sheet.
 - b) Optional painted finish consult manufacturer.
 - c) Class C standard optional Class A available consult manufacturer.
- f. Edge Channels.
 - 1) 0.062” thick, 3/4” leg, stainless steel edge channel.
 - 2) Applied to entire perimeter of the door.
 - 3) Sealed by 3M CP 25WB + Fire Barrier caulk applied to the inside edges of all the steel edge channels.
- g. Cutouts.
 - 1) Manufacture doors with cutouts for required vision lites per the manufactures listing.
- h. Hardware.
 - 1) Pre-machine doors in accordance with templates from specified hardware manufacturers.
 - 2) Field apply factory supplied gaskets and seals, full width intumescent and smoke seal required at top of door, smoke seals required on both jambs.

2.4 FRAMING

A. Framing

- 1. FR-Series Fiberglass Framing.
 - a. Maximum of 45 min fire rating when installed in fiberglass frames.
 - b. Materials.

- 1) 1/4" thick, solid, pultruded, FRP profiles.
 - 2) No corrosive components or reinforcements.
 - 3) Solid tectonite filler.
 - 4) No steel or aluminum filler is allowed.
- c. Perimeter Frame Members.
- 1) Factory fabricated.
 - 2) Integral 5/8" x 2-1/4" doorstop.
 - 3) Mitered with 4" x 4" x 3/8" pultruded FRP angle reinforcement with interlocking pultruded FRP brackets.
 - 4) 5-3/4", 6-3/4", 7-3/4", or 8-3/4" jamb depth.
 - 5) 2" face on jambs.
 - 6) 2" or 4" face on header.
 - 7) Knocked down for field assembly.
- d. Anchors
- 1) Factory furnished as specified by drawings.
 - 2) Drywall tuck available.
2. Any category C standard frame.
 3. Any category C proprietary frame.

2.5 PERFORMANCE

A. Face Sheet.

1. Standard Interior and Exterior Class C 0.120" thick, pebble texture, through color with SpecLite 3® integral surfaseal film FRP sheet.
 - a. Flexural Strength, ASTM-D790: 21 x 103 psi.
 - b. Flexural Modulus, ASTM-D790: 0.7 x 106 psi.
 - c. Tensile Strength, ASTM-D638: 13 x 103 psi.
 - d. Tensile Modulus, ASTM-D638: 1.2 x 106 psi.
 - e. Barcol Hardness, ASTM-D2583: 55.
 - f. Izod Impact, ASTM-D256: 14.0 ft-lb/in.
 - g. Gardner Impact Strength, ASTM-D5420: 120 in-lb.
 - h. Water Absorption, ASTM-D570: 0.20%/24hrs at 77°F.
 - i. Surface Burning, ASTM-E84: Flame Spread ≤ 200, Smoke Developed ≤ 450.
 - j. Taber Abrasion Resistance, Taber Test: 0.007% Max Wt. Loss, cs-17 wheels, 1000g. Wt., 25 cycles.
 - k. Chemical Resistance.
 - 1) Excellent Rating.
 - a) Acetic Acid, Concentrated.
 - b) Acetic Acid, 5%.

- c) Bleach Solution.
- d) Detergent Solution.
- e) Distilled Water.
- f) Ethyl Acetate.
- g) Formaldehyde.
- h) Heptane.
- i) Hydrochloric Acid, 10%.
- j) Hydrogen Peroxide, 3%.
- k) Isooctane.
- l) Lactic Acid, 10%.

1. USDA/FSIS Requirements.

- 1) FRP face sheet with SpecLite 3® integral surfaseal is a finished outer surface material that is rigid; durable; non-toxic; non-corrosive; moisture resistant; a light, solid color such as white; easily inspected; smooth or an easily cleaned texture.
- 2) FRP face sheet with SpecLite 3® integral surfaseal does not contain any known carcinogen, mutagen, or teratogen classified as hazardous substances; heavy metals or toxic substances; antimicrobials; pesticides or substances with pesticidal characteristics.

B. Door Assembly.

- 1. 60 min pp category A door.
- 2. 90 min pp category B door.
- 3. 90 min pp category A door.
- 4. Temperature rise @ 30 min, 250 °F when vision lites do not exceed 100 in².
- 5. Temperature rise @ 60 min, 450 °F max.

2.5 MATERIALS

A. Fiberglass

- 1. See 2.02.A.2.e.
- 2. See 2.02.B.2.e.
- 3. See 2.02.C.2.e

B. Fasteners

- 1. All exposed fasteners will have a finish to match material being fastened.
- 2. 410 stainless steel or other non-corrosive metal.
- 3. Must be compatible with items being fastened.

2.6 FABRICATION

A. Factory Assembly.

4. Door and frame components from the same manufacturer.
5. Required size for door and frame units shall be as indicated on the drawings.
6. Maintain continuity of line and accurate relation of planes and angles.
7. Secure attachments and support at mechanical joints with hairline fit at contact surfaces.

C. Shop Fabrication

1. All shop fabrication to be completed in accordance with manufactures process work instructions.
2. Quality control to be performed before leaving each department.

2.7 FINISHES

A. Door

1. FRP Face Sheets
 - a. Through color.
 - 1) Color:
 - a) Choose an item.
 - b. Painted
 - 1) Color:
 - 2) Choose an item.
 - 3) Custom colors available consult manufacturer

B. Frame

1. Fiberglass
 - a. Two-component flexible acrylic urethane Satin topcoat. (STANDARD)
 - 4) Color
 - 5) Choose an item.
 - 6) Custom colors available consult manufacturer.
 - 7) Excellent exterior durability.
 - 8) Unique, high-solids, high-build, multifunctional coating.
 - 9) Low VOC, Satin coating.
 - 10) Impact Resistance, ASTM D-4226 Minimum 1.2 in/lb/mil
 - 11) Color retention: $\leq 1\Delta$ (CIE L.a.b.), Montreal 45° South: 12 months
 - 12) Very good chemical resistance.
 - b. Two-component acrylic urethane enamel Gloss topcoat. (OPTIONAL)
 - 13) Color:
 - 14) Custom colors available consult manufacturer.
 - 15) Unique, high-solids, high-build, multifunctional coating.
 - 16) Low VOC, Gloss coating.
 - 17) Impact Resistance, ASM-D2794: 80-102 in/lb (direct), 40-80 in/lb (reverse) @ 1.5 mils thickness.
 - 18) Color retention: $\Delta E < 5$ (CIE L.a.b.), Florida Exposure: 18 months.

2.8 ACCESSORIES – Excellent chemical resistance

A. Vision Lites

1. Factory Glazing.
2. Stainless Steel vision kit with 3/16" NGP Firelite NT, clear.
3. Size as indicated on the drawings.
4. 60 to 90-minute rated doors.
 - a. Maximum 704 in² in listed and labeled kit for positive pressure applications using listed glazing. Minimum 5" from top or edge of door to lite cutout and minimum 5" from latch cutout to lite cutout.
 - b. Maximum 32" high.
 - c. Maximum 22" wide.
 - d. Multiple lights are allowed when the sum of the areas does not exceed the tested area with the maximum length and width limitations.
5. 20 to 45-minute rate doors.

Listed metal vision frames and listed glazing are limited to a maximum clear view area of 616 in² per lite with a maximum of 1232 in². Lite kits exceeding 100 in² void the temperature requirements per NFPA 80 unless temperature resistive glazing is used.

B. Louvers

3. Listed and labeled louvers.
4. Maximum 576 in².
5. Maximum width 24".
6. Maximum height 24".

C. Hardware

7. All hardware must be listed and labeled for use in mineral core fire doors.
8. Pre-machine doors in accordance with templates from specified hardware manufactures and hardware schedule.
9. Factory install hardware.

10. EPT Units

- a. Allowed between top and middle hinge locations.
- b. 1/16" maximum clearance per side when installing EPT.
- c. Limited to maximum 60 min positive and neutral pressure applications.
- d. Intumescent caulk or strips are required on bottom, top, and side of EPT device.

11. Hardware Schedule.

- a. Choose an item.
 - 1) Hinges Per NFPA 80, Table 6.4.3.1.
 - a) Choose an item. Click or tap here to enter text.
 - 2) Locking Hardware
 - a) Single point latching on singles, 4-point latching for pairs.

- b) Must be listed for use with mineral-core fire doors.
 - c) 3-point latching for 60-min and lower pairs with rated astragal.
 - d) Surface vertical rod less bottom rod allowed on 45-min and lower pairs and singles with door to door or door to floor fire pin installed in each leaf.
 - e) Rim x Rim with listed mullion allowed for 90-min. pairs.
 - f) Click or tap here to enter text.
- 3) Surface Bolts.
 - a) Click or tap here to enter text.
 - 4) Protection plates.
 - a) Brass, bronze, steel, aluminum, polycarbonate or decorative laminate maximum 12 from bottom rail.
 - b) Click or tap here to enter text.
 - 5) Astragal
 - a) Rated metal astragal required on pairs with 3-point latching, maximum 60 min. duration.
- D. Wire Raceway
- 1. Single swing applications only.
 - 2. 3/8" x 3/8" bore.
 - 3. Maximum height of 40" from bottom edge of door.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive doors.
- B. Notify architect of conditions that would adversely affect installation or subsequent use.
- C. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.3 ERECTION

- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors plumb, level, square, true to line, and without warp or rack.
- C. Anchor frames securely in place.

- D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by architect.
- E. Set thresholds in bed of mastic and back seal.
- F. Install exterior doors to be weathertight in closed position.
- G. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by architect.
- H. Remove and replace damaged components that cannot be successfully repaired as determined by architect.

3.4 FIELD QUALITY CONTROL

- A. Manufacture's Field Services.
 - 1. Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

3.5 ADJUSTING

- A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.6 CLEANING

- A. Clean doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that would damage finish.

3.7 PROTECTION

- A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION 08 17 43

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Access doors and frames for walls and ceilings.
- B. Related Sections include the following:
 - 1. Division 08 Section "Door Hardware" for mortise or rim cylinder locks and master keying
 - 2. Division 09 Section "Gypsum Board" for wall construction.
 - 3. Division 23 Section "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.3 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
- C. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.
- B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. NFPA 252 for vertical access doors and frames.
 - 2. ASTM E 119 for horizontal access doors and frames.

- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

- A. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS) with A60 zinc-iron-alloy (galvannealed) coating or G60 mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924.
- B. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation for Metallic-Coated Steel Sheet: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - a. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
 - 2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Babcock-Davis; A Cierra Products Co.
 - 2. J. L. Industries, Inc.
 - 3. Larsen's Manufacturing Company.
- B. Flush Access Doors and Frames with Exposed Trim: Fabricated from metallic-coated steel sheet.
 - 1. Locations: Wall and ceiling surfaces.

2. Door: Minimum 0.060-inch thick sheet metal, set flush with exposed face flange of frame.
3. Frame: Minimum 0.060-inch thick sheet metal with 1-inch wide, surface-mounted trim.
4. Hinges: Spring-loaded, concealed-pin type.
5. Lock: Mortise cylinder.
 - a. Lock Preparation: Prepare door panel to accept cylinder supplied by access door manufacturer.

C. Fire Rated, Uninsulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from metallic-coated steel sheet.

1. Locations: Wall surfaces.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Door: Minimum 0.060-inch thick sheet metal, flush construction.
4. Frame: Minimum 0.060-inch thick sheet metal with 1-inch wide, surface-mounted trim.
5. Hinges: Concealed-pin type.
6. Automatic Closer: Spring type.
7. Lock: Self-latching device with mortise cylinder lock.

- a. Lock Preparation: Prepare door panel to accept cylinder supplied by access door manufacturer.

2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
 1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
 2. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed (2 locks per door when more than 10").
 1. For cylinder lock, furnish two keys per lock and key all locks alike.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13

SECTION 08 33 00 - ROLLING GRILLES - OPEN DESIGN

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Electric operated overhead rolling grilles.
- B. Related Sections:
 - 1. 05 50 00 Metal Fabrications. Door opening jamb and head members.
 - 2. 06 10 00 Rough Carpentry. Door opening jamb and head members.
 - 3. 08 31 00 Access Doors and Panels. Access doors.
 - 4. 08 70 00 Hardware. Masterkeyed cylinders.
 - 5. Division 26. Electrical wiring and conduit, fuses, disconnect switches, connection of operator to power supply, and installation of control station and wiring.
- C. Products That May Be Supplied, But Are Not Installed Under This Section:
 - 1. Control station.

1.2 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Cycle Life:
 - a. Design grilles of standard construction for normal use of up to 5 cycles per day maximum, and an overall maximum of 50,000 operating cycles for the life of the grille.

1.3 SUBMITTALS

- A. Reference Section 01 33 00 Submittal Procedures; submit the following items:
 - 1. Product Data
 - 2. Shop Drawings: Include special conditions not detailed in Product Data. Show interface with adjacent work.
 - 3. Quality Assurance/Control Submittals:
 - a. Provide proof of manufacturer ISO 9001:2015 Registration.
 - b. Provide proof of manufacturer and installer qualifications - see 1.3 below.
 - c. Provide manufacturer's installation instructions.
 - 4. Closeout Submittals:
 - a. Operation and Maintenance Manual.
 - b. Certificate stating that installed materials comply with this specification.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: ISO 9001:2015 registered and a minimum of five years' experience in producing grilles of the type specified.
2. Installer Qualifications: Manufacturer's approval.

1.5 DELIVERY STORAGE AND HANDLING

- A. Reference Section 01 66 00 Product Storage and Handling Requirements.
- B. Follow manufacturer's instructions.

1.6 WARRANTY

- A. Standard Warranty: Two years from date of shipment against defects in material and workmanship.
- B. Maintenance: Submit for owner's consideration and acceptance of a maintenance service agreement for installed products.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer: Cornell - 24 Elmwood Ave. Mountain Top, PA 18707. Underwriters Laboratories, Inc. (UL), ISO 9001:2008 Registered.
 1. Distributor: John Walsh | Architectural Design Support
john.walsh@cornellcookson.com | 800.233.8366 ext. 4070
- B. Model: ESG10
- C. Approved Equal: Cookson - 1901 South Litchfield Rd, Goodyear, AZ, 85338. Telephone: (800) 294-4358.
- D. Substitutions: Reference Section 01 25 13 Product Substitution Procedures.
 1. Alternates:
 - a. Cookson
 - b. Clopay

2.2 MATERIALS

- A. Curtain:

1. ESG10 Straight Pattern
 - a. Horizontal Rods: Solid 5/16 inch diameter, 5056 H32 aluminum alloy.
 - 1) Vertical Spacing: 2 inches on center.
 - b. Vertical Chains: Grommetted aluminum links, 3/4 inch wide, positioned by E-rings on 9 inch centers. Provide double E-rings on horizontal bars on both sides of end chains to retain curtain in guides.
 2. Bottom Bar: 2 x 3-1/2 inch extruded aluminum tubular section reinforced with 3 x 2 x 3/16 inch aluminum angle(s).
 3. Finish:
 - a. Aluminum Curtain and Bottom Bar:
 - 1) Curtain: Clear anodized.
 - 2) Bottom Bar: Clear anodized.
- B. Guides, Wall Mounted: Heavy duty extruded aluminum sections with snap-on cover to conceal fasteners and polypropylene pile runners on both sides of curtain. Provide steel mounting angle as required for face of wall installation.
1. Finish, Aluminum Guide Components:
 - a. Clear anodized.
 2. Finish, Steel Mounting Angles:
 - a. Zirconium treatment followed by a light gray baked-on polyester powder coat; minimum 2.5 mils cured film thickness.
- C. Counterbalance Shaft Assembly:
1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot of width.
 2. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of grille to ensure that maximum effort to operate will not exceed 25 lbs (110 N). Provide wheel for applying and adjusting spring torque.
- D. Brackets: Fabricate from minimum 3/16 inch steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
1. Finish:
 - a. Zirconium treatment followed by a light gray baked-on polyester powder coat; minimum 2.5 mils cured film thickness.

2.3 ACCESSORIES

- A. Locking:
 1. Motor Operated:

- a. Keyed cylinder locking into both jambs operable from both sides of curtain with motor interlock cutout switches.

2.4 OPERATION

- A. Supply Model MG Electric Motor Operator, industrial duty - rated for a maximum of 20 cycles per hour, cULus listed, Totally Enclosed Non Ventilated gear head operator(s) rated (1/3) (1/2) or (3/4) hp as recommended by door manufacture for size and type of door, 208 Volts, 3-Phase. Provide complete with electric motor and factory pre-wired motor control terminals, maintenance free solenoid actuated brake, emergency manual chain hoist and control station(s). Motor shall be high starting torque, industrial type, protected against overload with an auto-reset thermal sensing device. Primary speed reduction shall be heavy-duty, lubricated gears with mechanical braking to hold the door in any position. Operator shall be equipped with an emergency manual chain hoist assembly that safely cuts operator power when engaged. A disconnect chain shall not be required to engage or release the manual chain hoist. Operator drive and door driven sprockets shall be provided with #50 roller chain. Provide an integral Motor Mounted Interlock system to prevent damage to door and operator when mechanical door locking devices are provided. Operator shall be capable of driving the door at a speed of 6 to 9 inches per second (15 to 23 cm/sec). Fully adjustable, driven linear screw type cam limit switch mechanism shall synchronize the operator with the door. The electrical contractor shall mount the control station(s) and supply the appropriate disconnect switch, all conduit and wiring per the overhead door wiring instructions.
 - 1. Control Station: Flush mounted, "Open/Close/Stop" push buttons; NEMA 1B.
- B. Entrapment Protection: Provide the following primary entrapment protection device to enable momentary contact close operation.
 - 1. Provide a continuously monitored, wireless sensing/weather edge seal extending full width of door bottom bar. Contact before door fully closes shall cause door to immediately stop downward travel and reverse direction to the fully opened position.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
- C. Commencement of work by installer is acceptance of substrate.

3.2 INSTALLATION

- A. General: Install grille and operating equipment with necessary hardware, anchors, inserts, hangers and supports.

- B. Follow manufacturer's installation instructions.

3.3 ADJUSTING

- A. Following completion of installation, including related work by others, lubricate, test, and adjust grilles for ease of operation, free from warp, twist, or distortion.

3.4 CLEANING

- A. Clean surfaces soiled by work as recommended by manufacturer.
- B. Remove surplus materials and debris from the site.

3.5 DEMONSTRATION

- A. Demonstrate proper operation to Owner's Representative.
- B. Instruct Owner's Representative in maintenance procedures.

END OF SECTION 08 33 00

SECTION 08 41 00 - ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Furnish and install aluminum entrance, entrance door frames complete with hardware, and related components as shown on the drawings and specified in this section.
- B. All doors shall be EFCO® Series D518 DuraStile Wide Stile Entrance Door and Frame and EFCO® 403X framing at sidelites (Front Glazed). Other manufacturers requesting approval to bid their product as an equal must submit the following information fifteen days prior to close of bidding.
 - 1. A sample door (size and configuration) as per requirements of architect.
 - 2. Test reports documenting compliance with requirements of Section 1.05.
 - 3. Acceptable manufactures:
 - a. EFCO
 - b. Wausau
 - c. Kawneer
- C. Glass and Glazing
 - 1. Reference Section 08 81 00 for Glass and Glazing.
- D. Single Source Requirement
 - 1. All products listed in Section 1.02 shall be by the same manufacturer.

1.2 RELATED WORK

- A. Section 08 51 13 – Aluminum Windows

1.3 ITEMS INSTALLED BUT NOT FURNISHED

- A. Structural support of the framing, wood framing, structural steel, and final cleaning.

1.4 LABORATORY TESTING AND PERFORMANCE REQUIREMENTS

- A. Test Units
 - 1. Air test unit shall be minimum size of 36" x 84".
- B. Test Procedures and Performances

1. Entrance doors shall conform to all requirements for the door type referenced in 1.01.B. In addition, the following specific performance requirements shall be met.
2. Air Infiltration Test
 - a. With door sash closed and locked, test unit in accordance with ASTM E 283 at a static air pressure difference of 1.57 psf (75 Pa).
 - b. Air infiltration shall not exceed .50 cfm/SF (2.54 l/s•m²) of unit, for single doors.
 - c. Air infiltration shall not exceed .10 cfm/SF (.50 l/s•m²) of unit, for a pair of doors.

C. Project Wind Loads

1. The system shall be designed to withstand the following loads normal to the plane of the wall:
 - a. Positive pressure of 20 psf at non-corner zones.
 - b. Negative pressure of 20 psf at non-corner zones.
 - c. Negative pressure of 20 psf at corner zones.

1.5 QUALITY ASSURANCE

- A. Provide test reports from AAMA accredited laboratories certifying the performance as specified in 1.05.
- B. Test reports shall be accompanied by the entrance door manufacturer's letter of certification stating that the tested door meets or exceeds the referenced performance standard for the appropriate door type.

1.6 SUBMITTALS

- A. Contractor shall submit shop drawings, finish samples, test reports, and warranties.
 1. Samples of materials as may be requested without cost to owner, i.e., metal, glass, fasteners, anchors, frame sections, corner section, etc.

1.7 WARRANTIES

- A. Total Entrance Door / Storefront Installation
 1. The responsible contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total entrance door installation which includes that of the doors, hardware, glass (including insulated units), glazing, anchorage and setting system, sealing, flashing, etc., as it relates to air and structural adequacy as called for in the specifications and approved shop drawings.
 2. Any deficiencies due to such elements not meeting the specifications shall be corrected by the responsible contractor at his expense during the warranty period.
- B. Window Material and Workmanship

1. Provide written guarantee against defects in material and workmanship for 3 years from the date of final shipment.

C. Glass

1. Provide written warranty for insulated glass units that they will be free from obstruction of vision as a result of dust or film formation on the internal glass surfaces caused by failure of the hermetic seal due to defects in material and workmanship.
2. Warranty period shall be for 10 (ten) years.

D. Finish

1. Warranty period shall be for 10 years from the date of final shipment.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Aluminum

1. Extruded aluminum shall be 6063-T6 alloy and temper.

B. Hardware

1. See Section 08 71 00
2. Hardware for entrance doors (check with entrance door manufacturer for compatibility with door) is specified under "Hardware Section" of the specifications and shall be sent to the door manufacturer for application. The finish hardware supplier shall be responsible for furnishing physical hardware and templates of all hardware to the entrance door manufacturer prior to fabrication, and for coordinating hardware delivery requirements with the hardware manufacturer, the general contractor and the entrance door manufacturer to ensure the building project is not delayed.

C. Glass

1. Monolithic glass 1/4" thick, clear color, School Guard Glass SG4 forced entry laminated glass meeting UL972.
2. Insulated glass shall be 1" thick:
 - a. Exterior lite – 1/4" thick, clear color, tempered glass, with a surface coating of Solarban60 or SNX 62/27 on the number 2 surface.
 - b. Air space of 1/2" inch (argon filled).
 - c. Interior lite – 11/6" thick, clear color, School Guard Glass SG4 forced entry laminated glass meeting UL972.

2.2 FABRICATION

A. General

1. Major portions of the door sections shall have .188" wall thickness. Glazing stop sections shall have .050" wall thickness.

B. Entrance Doors

1. Door stiles shall be no less than 5" wide (not including glass stops).
2. Door stiles and rails shall have hairline joints at corners. Heavy concealed reinforcement brackets shall be secured with screws and shall be of deep penetration and fillet welded.
3. Weather stripping shall be wool pile and shall be installed in one stile of door pairs and in jamb stiles of center pivoted doors.

C. Door Frame (Front Glazed)

1. Depth of frame shall not be less than 4 1/2".
2. Face dimension shall not be less than 2".
3. Shear block construction shall be utilized throughout.
4. System design shall be such that raw edges will not be visible at joints.
5. Sidelites shall be thermally broken utilizing double poured and debridged construction.

D. Glazing

1. All units shall be dry glazed with extruded pressure fitting aluminum glazing stops, and EPDM gaskets.

E. Finish

1. Anodic
 - a. Finish all exposed areas of aluminum windows and components with electrolytically deposited color in accordance with Aluminum Association Designation AA-M10-C22-A41. Color shall be Clear.

PART 3 - EXECUTION

3.1 INSPECTION

A. Job Conditions

1. All openings shall be prepared by others to the proper size and shall be plumb, level, and in the proper location and alignment as shown on the architect's drawings.

3.2 INSTALLATION

- A. Use only skilled tradesmen with work done in accordance with approved shop drawings and specifications.

- B. Plumb and align entrance door faces in a single plane for each wall plane and erect doors and materials square and true. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, specified building movement, and specified wind loads.
- C. Adjust doors for proper operation after installation.
- D. Furnish and apply sealants to provide a weather tight installation at all joints and intersections and at opening perimeters. Wipe off excess material and leave all exposed surfaces and joints clean and smooth.

3.3 ANCHORAGE

- A. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, specified building movement, and specified wind loads.

3.4 PROTECTION AND CLEANING

- A. After completion of entrance installation, entrance doors shall be inspected, adjusted, put into working order and left clean, free of labels, dirt, etc. Protection from this point shall be the responsibility of the general contractor.

END OF SECTION 08 41 00

SECTION 08 44 13 - GLAZED ALUMINUM CURTAIN WALL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Furnish and install architectural aluminum curtain wall complete with related components as shown on drawings and specified in this section.
- B. Curtain Wall System shall be EFCO® Series 5600 Outside Glazed with Duracast Fiberglass Pressure Plate. Other manufacturers requesting approval to bid their product as an equal must submit the following information fifteen days prior to close of bidding.
 - 1. A proposal drawing showing full size details of all curtain wall components including all anchors and building attachments.
 - 2. Test reports documenting compliance with requirements of Section 1.05.
- C. Glass
 - 1. Reference Section 08 81 00 for Glass and Glazing.
- D. Single Source Requirement
 - 1. All products listed in Section 1.02 shall be by the same manufacturer.

1.2 RELATED WORK

- A. Section 08 41 13 – Aluminum – Framed Entrances and Storefronts
- B. Section 08 51 13 – Aluminum Windows

1.3 LABORATORY TESTING AND PERFORMANCE REQUIREMENTS

- A. Test Units
 - 1. Air, water, and structural test unit size shall be a minimum of two stories high and three lites wide.
 - 2. Thermal test unit sizes shall be 80" wide x 80" high with one intermediate vertical mullion and two lites of glass.
- B. Test Procedures and Performance
 - 1. Air Infiltration Test

- a. Test unit in accordance with ASTM E 283 at a static air pressure difference of 6.24 psf (300 Pa).
 - b. Air infiltration shall not exceed .06 cfm/SF (.31 l/s•m²) of unit.
2. Water Resistance Test
- a. Test unit in accordance with ASTM E 331.
 - b. The test for static water penetration (ASTM E 331) shall be conducted at an air pressure difference of 15.0 psf (720 Pa). There shall be no water leakage as defined by AAMA 501.1, paragraph 5.5.
3. Uniform Load Deflection Test
- a. Test in accordance with ASTM E 330.
 - b. Deflection under design load shall not exceed L/175 for spans less than 162" (4114 mm).
 - c. Deflection under design load shall not exceed L/240 +1/4" for spans greater than 162".
4. Uniform Load Structural Test
- a. Test in accordance with ASTM E 330 at a pressure 1.5 times the design wind pressure in 1.05.B.3.b.
 - b. At conclusion of the test there shall be no glass breakage, permanent damage to fasteners, curtain wall parts, or any other damage that would cause the curtain wall to be defective.
5. Condensation Resistance Test (CRF)
- a. Test unit in accordance with AAMA 1503.1.
 - b. Condensation Resistance Factor (CRF) shall not be less than 61(frame) when glazed with 29 center of glass U-Factor. (See chart at end of section).
6. Thermal Transmittance Test (Conductive U-Factor)
- a. With ventilators closed and locked, test unit in accordance with NFRC 100-2010.
 - b. Conductive thermal transmittance (U-Factor) shall not be more than .33 BTU/hr•ft²•°F when glazed with .24 center of glass U-Factor.
7. Seismic Performance
- a. Test unit in accordance to AAMA 501.4 system to meet design displacement of 0.010 x the greater adjacent story height and ultimate displacement of 1.5 x the design displacement.
8. Sound Transmission Loss
- a. Test unit in accordance with ASTM E 90-02.

- b. Sound Transmission Class (STC) shall not be less than 29.

C. Project Wind Loads

- 1. The system shall be designed to withstand the following loads normal to the plane of the wall:
 - a. Positive pressure of ___ psf (___ Pa) at non-corner zones.
 - b. Negative pressure of ___ psf (___ Pa) at non-corner zones.
 - c. Negative pressure of ___ psf (___ Pa) at corner zones.

1.4 QUALITY ASSURANCE

- A. Provide test reports from AAMA accredited laboratories certifying the performance as specified in 1.05.
- B. Test reports shall be accompanied by the curtain wall manufacturer's letter of certification stating that the tested curtain wall meets or exceeds the referenced criteria for the appropriate curtain wall type.

1.5 SUBMITTALS

- A. Contractor shall submit shop drawings; finish samples, test reports, and warranties.
 - 1. Samples of materials as may be requested without cost to owner, i.e., metal, glass, fasteners, anchors, frame sections, mullion section, corner section, etc.

1.6 WARRANTIES

- A. Total Curtain Wall Installation
 - 1. The responsible contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total curtain wall installation. This includes the glass (including insulated units), glazing, anchorage and setting system, sealing, flashing, etc. as it relates to air, water, and structural adequacy and the specifications and approved shop drawings.
 - 2. Any deficiencies due to such elements not meeting the specifications shall be corrected by the responsible contractor at their expense during the warranty period.
- B. Material and Workmanship
 - 1. Provide written guarantee against defects in material and workmanship for 5 years from the date of final shipment.
- C. Glass
 - 1. Provide written warranty for insulated glass units, that they will be free from obstruction of vision as a result of dust or film formation on the internal glass surfaces caused by failure of the hermetic seal due to defects in material and workmanship.

2. Warranty period shall be for 10 (ten) years.
- D. Finish
1. Warranty period shall be for 10 years from the date of final shipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum
1. Extruded aluminum shall be 6063-T6 alloy and temper.
- B. Glass – Solera S R5 + Aerogel 1.03”.
- C. Anchors
1. Perimeter and floor line anchors shall be aluminum or steel. All steel anchors shall be properly insulated from the aluminum.
- D. Duracast Pressure Plate
1. Material shall be a fiberglass composite with a Flexural strength of no less than 82 ksi(565 Mpa) along the lineal’s major axis.
 2. Material thermal conductivity shall be no more than 2 BTU·in/hr·ft²·°F (0.289 W/m²·K)

2.2 FABRICATION

- A. General
1. All aluminum vertical and horizontal extrusions shall have a minimum wall thickness of .093" to .125".
- B. Frame
1. Frame components shall be mechanically fastened by means of extruded aluminum shear blocks attached to vertical mullions.
 2. Curtain wall system is able to accommodate separate interior and exterior finishes and colors.
- C. Glazing
1. Outside glazed curtain wall system shall be dry glazed with an exterior Duracast® pressure plate and snap cover with interior and exterior dense EPDM preset gaskets.

2.3 FINISHES

A. Anodic

1. Finish all exposed areas of aluminum windows and components with electrolytically-deposited color in accordance with Aluminum Association Designation.
2. Clear Anodized

PART 3 - EXECUTION

3.1 INSPECTION

A. Job Conditions

1. All openings shall be prepared by others to the proper size and shall be plumb, level, and in the proper location and alignment as shown on the architect's drawings.
2. Provide for manufacturer representation to conduct pre-installation site meeting.

3.2 INSTALLATION

- A. Use only skilled tradesmen with work done in accordance with approved shop drawings and established specifications and erect all curtain wall components to all building bench marks and column center lines.
- B. Plumb and align curtain wall faces in a single plane for each wall plane, and erect curtain wall materials square and true. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, building movement, and specified wind loads.
- C. Adjust windows in curtain wall for proper operation after installation.
- D. Furnish and apply sealants to provide a weather tight installation at all joints and intersections and at opening perimeters. Wipe off excess material, leave all exposed surfaces and joints clean and smooth.

3.3 ANCHORAGE

- A. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, specified building movement, and specified wind loads.

3.4 PROTECTION AND CLEANING

- A. The general contractor shall protect the aluminum materials and finish against damage from construction activities and harmful substances. The general contractor shall remove any protective coatings as directed by the architect and shall clean the aluminum surfaces as recommended for the type of finish applied.

- B. A bi-annual sweetwater rinse is recommended to prohibit dirt, dust, and debris from accumulation on the surface of the coating and to help maintain the aesthetic of the coating.

END OF SECTION 08 44 13

SECTION 08 51 13 - ALUMINUM SLIDING WINDOWS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Furnish and install aluminum architectural windows complete with hardware and related components as shown on drawings and specified in this section.
- B. All Sliding windows shall be EFCO® Series SX45 Premium Thermal AW-PG70-HS Horizontal Sliding. All fixed windows shall be EFCO® Series 450X Thermal AW-PG150-FW. Other manufacturers requesting approval to bid their product as an equal must submit the following information fifteen days prior to close of bidding.
 - 1. A sample window, 36" x 24" single unit, as per requirements of architect.
 - 2. Test reports documenting compliance with requirements of Section 1.05.
 - 3. Acceptable manufactures:
 - a. Graham
 - b. Wausau
 - c. Kawneer
- C. Glass and Glazing
 - 1. All units shall be factory glazed.
- D. Single Source Requirement
 - 1. All products listed in Section 1.02 shall be by the same manufacturer.

1.2 RELATED WORK

- A. Section 08 41 13 – Aluminum – Framed Entrances and Storefronts

1.3 ITEMS FURNISHED BUT NOT INSTALLED

1.4 ITEMS INSTALLED BUT NOT FURNISHED

1.5 LABORATORY TESTING AND PERFORMANCE REQUIREMENTS

- A. Test Units
 - 1. Air, water, and structural test unit shall conform to requirements set forth in AAMA/WDMA/CSA 101/I.S.2/A440 – 08 and manufacturer's standard locking/operating hardware and insulated glazing configuration.

2. Thermal test unit sizes shall be 72" x 48". Unit shall consist of a single horizontal sliding window.

B. Test Procedures and Performances

1. Windows shall conform to all AAMA/WDMA/CSA 101/I.S.2/A440–08 requirements for the window type referenced in 1.01.B. In addition, the following specific performance requirements shall be met.
2. Life Cycle Testing
 - a. Test in accordance with AAMA 910. There shall be no damage to fasteners, hardware parts, support arms, activating mechanisms, or any other damage that would cause the window to be inoperable. Air infiltration and water resistance tests shall not exceed specified requirements.
3. Air Infiltration Test
 - a. With ventilators closed and locked, test unit in accordance with ASTM E 283 at a static air pressure difference of 6.24 psf (299 Pa).
 - b. Air infiltration shall not exceed .10 cfm/SF (.50 l/s•m²) of unit.
4. Water Resistance Test
 - a. With ventilators closed and locked, test unit in accordance with ASTM E 331/ASTM E 547 at a static air pressure difference of 15.0 psf (718 Pa).
 - b. There shall be no uncontrolled water leakage.
5. Uniform Load Deflection Test
 - a. With ventilators closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference of 70 psf (3351 Pa), positive and negative pressure.
 - b. No member shall deflect over L/175 of its span.
6. Uniform Load Structural Test
 - a. With ventilators closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference of 105.0 psf (5027 pa), both positive and negative.
 - b. At conclusion of test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms, nor any other damage that would cause the window to be inoperable.
7. Forced Entry Resistance
 - a. Windows shall be tested in accordance to ASTM F 588 or AAMA 1302.5 and meet the requirements of performance level 40.

8. Condensation Resistance Test – (CRF)
 - a. Test unit in accordance with AAMA 1503.1.
 - b. Condensation Resistance Factor (CRF) shall not be less than 81 (slider frame) and 73 (fixed frame) when glazed with .24 center of glass U-Factor.
 9. Condensation Resistance – Sliding Windows (CR)
 - a. With ventilators closed and locked, test unit in accordance with NFRC 500-2010.
 - b. Condensation Resistance (CR) shall not be less than 60 (slider frame) and 54 (fixed frame) when glazed with .24 center of glass U-Factor. (See chart at end of section).
 10. Thermal Transmittance Test (Conductive U-Factor)
 - a. With ventilators closed and locked, test unit in accordance with NFRC 100-2010.
 - b. Conductive thermal transmittance (U-Factor) shall not be more than .34 (slider) and .36 (fixed) BTU/hr•ft²•°F when glazed with .24 center of glass U-Factor.
- c. Project Wind Loads
1. The system shall be designed to withstand the following loads normal to the plane of the wall:
 - a. Positive pressure of 20 psf at non-corner zones.
 - b. Negative pressure of 20 psf at non-corner zones.
 - c. Negative pressure of 20 psf at corner zones.

1.6 FIELD TESTING AND PERFORMANCE REQUIREMENTS

- A. Windows shall be field tested in accordance with AAMA 502, “Voluntary Specification for Field Testing of Windows and Sliding Glass Doors,” using Test Method B.
 1. Test one additional window or two percent of the window installation, whichever is greater, for air infiltration and water penetration as specified.
 2. Cost for all successful tests, both original and retest shall be paid by the owner. All unsuccessful tests, both original and retest, shall be paid by the responsible contractor.
 3. Testing shall be by an AAMA accredited testing agency selected by the architect and window manufacturer and employed by the responsible contractor.
 4. Air infiltration field tests shall be conducted at the same uniform static test pressure as the laboratory test unit. The Maximum allowable rate of air leakage shall not exceed 1.5 times the laboratory test unit for hardware and glazing types consistent with the laboratory test unit. Performance values may be reduced due to deviations from the laboratory test unit such as product size, configuration, hardware selected, and glazing configuration. The field test air leakage rate shall not exceed 1.5 times the maximum

allowable laboratory performance specified in the testing criteria listed in Section 1.05.A.1 for any configuration.

5. Water penetration field tests shall be conducted at a static test pressure of 2/3 of the laboratory test performance values for hardware and glazing types consistent with the laboratory test unit. Performance values may be reduced due to deviations from the laboratory test unit such as product size, configuration, hardware selected, and glazing variations. The field test water test pressure shall not be less than 2/3 of the minimum allowable laboratory performance specified in the testing criteria listed in Section 1.05.A.1 for any configuration.

1.7 QUALITY ASSURANCE

- A. Provide test reports from AAMA accredited laboratories certifying the performance as specified in 1.05.
- B. Test reports shall be accompanied by the window manufacturer's letter of certification, stating the tested window meets or exceeds the referenced criteria for the appropriate window type listed.

1.8 SUBMITTALS

- A. Contractor shall submit shop drawings; finish samples, test reports, and warranties.
 1. Samples of materials may be requested without cost to owner, i.e., metal, glass, fasteners, anchors, frame sections, mullion section, corner section, etc.
- B. An NFRC Component Modeling Approach (CMA) generated label certificate shall be provided by the manufacturer. The label certificate shall be project specific and will contain the thermal performance ratings of the manufacturer's framing combined with the specified glass, and the glass spacer used in the fabrication of the glass, at NFRC standard test size as defined in table 4-3 in NFRC 100-2010.

1.9 WARRANTIES

- A. Total Window Installation
 1. The responsible contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total window installation which includes that of the windows, hardware, glass (including insulated units), glazing, anchorage and setting system, sealing, flashing, etc., as it relates to air, water, and structural adequacy as called for in the specifications and approved shop drawings.
 2. Any deficiencies due to such elements not meeting the specifications shall be corrected by the responsible contractor at their expense during the warranty period.
- B. Window Material and Workmanship

1. Provide written guarantee against defects in material and workmanship for 10 years from the date of final shipment.
- C. Glass
1. Provide written warranty for insulated glass units that will be free from obstruction of vision as a result of dust or film formation on the internal glass surfaces caused by failure of the hermetic seal due to defects in material and workmanship.
 2. Warranty period shall be for 10 (ten) years.
- D. Finish
1. Warranty period shall be for 10 years from the date of final shipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum

1. Extruded aluminum shall be 6063-T6 alloy and tempered.

B. Hardware

1. Concealed plunger lock in the meeting rail with a flush mounted actuating handle.
2. Sash shall ride on steel ball bearing rollers and a raised track, so dirt will not interfere with normal operation.

C. Weather-Strip

1. All primary weather-strip shall be Q-Lon[®] or equal.

D. Glass

1. Insulated panel shall be 1" thick NUDO Endurex 535 as manufactured by High Standard Inc.
 - a. Custom kynar finish (to match District Maroon)
 - b. Aluminum face sheet at interior and exterior
 - c. Cement board backers
 - d. Manufacture's standard core
2. Insulated glass shall be 1" thick with a center of glass U-Factor of .24 constructed as follows:
 - a. Exterior lite – 1/4" thick, Clear color, Temp glass
 - b. Air space of 1/2" inch argon filled.
 - c. Interior lite – 1/4" thick, clear color, Temp glass, with a surface coating of Solarban60 or equal on the number #3 surface.

E. Thermal Barrier

1. All exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier. For purposes of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.
2. The thermal barrier shall be thermal struts, consisting of glass reinforced polyamide nylon, mechanically crimped in raceways extruded in the exterior and interior extrusions. The sliding windows shall have factory installed extruded foam inserts between the thermal struts and areas as detailed.
3. Poured and debridged urethane thermal barriers shall not be permitted.

2.2 FABRICATION

A. General

1. All aluminum frame and sash extrusions shall have a minimum wall thickness of .062"
2. For sliding windows and .125 for all fixed windows. Frame sill members shall have a minimum wall thickness of .094"
3. Depth of frame shall not be less than 4-1/2".
4. Mechanical fasteners, welded components, and hardware items shall not bridge thermal barriers. Thermal barriers shall align at all frame and vent corners.
5. All frame and vent members shall be able to accommodate separate interior and exterior finishes and colors.

B. Frame

1. Frame components shall be mechanically fastened.
2. Frame and sash shall have a continuous interlock at the meeting rail.

C. Sash

1. Sash vertical members shall telescope into the sash horizontals and be mechanically fastened.
2. The sash shall be single or double weather-stripped.

D. Screens

1. Half screens only shall be permitted. The screen shall not be surface mounted.
2. Screen frames shall be extruded aluminum.
3. Screen mesh shall be aluminum.
4. Provide Hinge Screens on egress window (rescue window screen).

E. Glazing

1. All lites (both sash and fixed) of the horizontal sliding window shall be inside glazed and weeped.
2. All units shall be glazed with the manufacturer's standard sealant process provided the glass is held in place by a removable, extruded aluminum, glazing bead. The glazing bead must be isolated from the glazing material by a gasket.

3. All units shall be glazed with a minimum of 1/2" glass bit.

F. Finish

1. Anodic

- a. Finish all exposed areas of aluminum windows and components with electrolytically deposited color in accordance with Aluminum Association Designation AA-M10-C22A41 Color shall be Clear Anodized.

PART 3 - EXECUTION

3.1 INSPECTION

A. Job Conditions

1. Verify that openings are dimensionally within allowable tolerances, plumb, level, clean, provide a solid anchoring surface, and are in accordance with approved shop drawings.

3.2 INSTALLATION

- A. Use only skilled tradesmen with work done in accordance with approved shop drawings and specifications.
- B. Plumb and align window faces in a single plane for each wall plane, and erect windows and materials square and true. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, specified building movement, and specified wind loads.
- C. Adjust windows for proper operation after installation.
- D. Furnish and apply sealants to provide a weather tight installation at all joints and intersections and at opening perimeters. Wipe off excess material and leave all exposed surfaces and joints clean and smooth.

3.3 ANCHORAGE

- A. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, specified building movement, and specified wind loads.

3.4 PROTECTION AND CLEANING

- A. After completion of window installation, windows shall be inspected, adjusted, put into working order and left clean, free of labels, dirt, etc. Protection from this point shall be the responsibility of the general contractor.

END OF SECTION 08 51 13

SECTION 08 56 53 - SECURITY WINDOWS

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. Sliding, transaction security windows.

1.3 COORDINATION

- A. Coordinate installation of anchorages for security windows. 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 adjacent construction. Deliver such items to Project site in time for installation.

1.4 PREINSTALLATION MEETINGS

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

1.5 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 window units.
- B. Shop Drawings: For security windows.
 - 1. Include plans, elevations, sections, and attachments to other work.
 - 2. Full-size section details of framing members, including internal armoring, reinforcement, and stiffeners.
 - 3. Hardware for sliding window units.
 - 4. Glazing details.
- C. Samples for Initial Selection: For frame members with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Framing: 12-inch-long sections of frame members.
- E. Cutaway Sample: Corner of security window, made from 12-inch lengths of full-size components, and showing details of the following:
1. Joinery
 2. Anchorage
 3. Glazing
 4. Flashing and drainage

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and testing agency.
- B. Welding certificates.
- C. Product Test Reports: For each type of security window and accessory indicated as ballistics resistant, for tests performed by a qualified testing agency.
- D. Configuration Disclosure Drawing: For each type of forced-entry-resistant security window, complying with ASTM F 1233.
- E. Sample Warranty: For special warranty.
- F. Examination reports documenting inspections of substrates, areas, and conditions.
- G. Anchor inspection reports documenting inspections of built-in and cast-in anchors.
- H. Field quality-control reports documenting inspections of installed products.
 1. Field quality-control certification signed by Contractor and Detention Specialist.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation and maintenance of units required for this Project.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 2. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Pack security windows in wood crates for shipment. Crate glazing separate from frames unless factory glazed.
- B. Label security window packaging with drawing designation.

- C. Store crated security windows on raised blocks to prevent moisture damage.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace security windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including deflections exceeding 1/4 inch.
 - b. Failure of welds.
 - c. Faulty operation of sliding window hardware.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
2. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Attack Resistance: Provide units identical to those tested for compliance with requirements indicated, and as follows:
 1. Ballistics Resistance: Level 3, Bullet Resistant Polycarbonate, when tested according to UL 752.
- C. Structural Loads: Detention windows shall withstand the effects of wind loads, with no permanent deformation or breakage of components within window assembly when tested according to ASTM E 330.

2.2 SLIDING, TRANSACTION SECURITY WINDOWS

- A. Provide horizontal-sliding, transaction security windows.
 1. Armortec Level 3 Ballistic Sliding Transaction Window
 2. Creative Industries
- B. Configuration: One fixed-glazed panel and one horizontal-sliding glazed panel.

- C. Framing: Fabricate perimeter framing, mullions, and glazing stops from aluminum as follows:
 - 1. Profile: Manufacturer's standard, with minimum face dimension indicated.
- D. Glazing Meeting Edges: Polished glazing.
- E. Sill: Stainless-steel channel frame designed for gasket glazing.
- F. Sliding Window Hardware: Provide roller track designed for overhead support of two- or four-wheel carriage supporting horizontal-sliding glazed panel. Provide manufacturer's standard pull and lock with two keys for each horizontal-sliding glazed panel.
- G. Materials:
 - 1. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666 or ASTM A 240/A 240M, austenitic stainless steel, Type 304.
 - 2. Aluminum Extrusions: ASTM B 221. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength.
 - 3. Aluminum Sheet and Plate: ASTM B 209.

2.3 FABRICATION

- A. General: Fabricate security windows to provide a complete system for assembly of components and anchorage of window units.
 - 1. Provide units that are reglazable from the secure side without dismantling the nonsecure side of framing.
 - 2. Prepare security windows for glazing unless preglazing at the factory is indicated.
- B. Framing: Miter or cope corners the full depth of framing; weld and dress smooth.
 - 1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security windows to comply with ballistics-resistance performance indicated.
- C. Glazing Stops: Finish glazing stops to match security window framing.
 - 1. Secure-Side (Exterior) Glazing Stops: Welded or integral to framing.
 - 2. Nonsecure-Side (Interior) Glazing Stops: Removable, coordinated with glazing indicated.
- D. Welding: Weld components to comply with referenced AWS standard. To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- E. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

- F. Factory-cut openings in glazing for speaking apertures.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.6 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: No. 4.

2.7 ACCESSORIES

- A. Concealed Bolts: ASTM A 307, Grade A unless otherwise indicated.
- B. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum 3/16 inch thick; with minimum 1/2-inch-diameter, headed studs welded to back of plate.
- C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- D. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers and with a proven record of compatibility with surfaces contacted in installation.
 - 1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
 - 2. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.

3. Spacers: Elastomeric blocks or continuous extrusions with a Type A Shore durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
 4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- E. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, complying with ASTM B 633; provide sufficient strength to withstand design pressures indicated.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- G. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Sealant shall remain permanently elastic, nonshrinking, and nonmigrating.

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 security windows.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of security windows.
- D. Inspect built-in and cast-in anchor installations, before installing security windows, to verify that anchor installations comply with requirements. Prepare inspection reports.
 1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
 2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.
- E. For glazing materials whose orientation is critical for performance, verify installation orientation.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other security window anchors whose installation is specified in other Sections.

1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

3.3 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing security windows to in-place construction. Include threaded fasteners for inserts, security fasteners, and other connectors.
 1. Install an attached or integral flange to secure side of security windows extending over rough-in opening gap so that gap has same forced-entry-resistance and ballistics-resistance performance as security window.
- B. Glazed Framing: Provide gasket-glazed framing.
- C. Removable Glazing Stops and Trim: Fasten components with security fasteners.
- D. Fasteners: Install security windows using fasteners recommended by manufacturer with head style appropriate for installation requirements, strength, and finish of adjacent materials. Provide stainless-steel fasteners in stainless-steel materials.
- E. Sealants: Comply with requirements in Section 07 92 00 "Joint Sealants" for installing sealants, fillers, and gaskets.
 1. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction unless otherwise indicated.
 2. Seal frame perimeter with sealant to provide weathertight construction unless otherwise indicated.
- F. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
- B. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- C. Prepare field quality-control certification that states installed products and their installation comply with requirements in the Contract Documents.

3.5 ADJUSTING

- A. Adjust horizontal-sliding, transaction security windows to provide a tight fit at contact points for smooth operation and a secure enclosure.
- B. Remove and replace defective work, including security windows that are warped, bowed, or otherwise unacceptable.

3.6 CLEANING AND PROTECTION

- A. Clean surfaces promptly after installation of security windows. Take care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.
 - 1. Lubricate sliding security window hardware.
- B. Clean glass of preglazed security windows promptly after installation. Comply with requirements in Section 08 80 00 "Glazing" for cleaning and maintenance.
- C. Provide temporary protection to ensure that security windows are without damage at time of Substantial Completion.

3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain operable security windows.

END OF SECTION 08 56 53

SECTION 08 71 00 – DOOR HARDWARE

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 SUMMARY

A. Section includes:

- 1. Mechanical and electrified door hardware for:
 - a. Swinging doors.
 - b. Sliding doors.
- 2. Electronic access control system components, including:
 - a. Electronic access control devices.
- 3. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
- 4. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

- 1. Windows
- 2. Cabinets (casework), including locks in cabinets
- 3. Signage
- 4. Toilet accessories
- 5. Overhead doors

C. Related Sections:

- 1. Division 01 Section "Alternates" for alternates affecting this section.
- 2. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
- 3. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.
- 4. Division 26 sections for connections to electrical power system and for low-voltage wiring.
- 5. Division 28 sections for coordination with other components of electronic access control system.

1.03 REFERENCES

- A. UL - Underwriters Laboratories
 - 1. UL 10B - Fire Test of Door Assemblies
 - 2. UL 10C - Positive Pressure Test of Fire Door Assemblies
 - 3. UL 1784 - Air Leakage Tests of Door Assemblies
 - 4. UL 305 - Panic Hardware
- B. DHI - Door and Hardware Institute
 - 1. Sequence and Format for the Hardware Schedule
 - 2. Recommended Locations for Builders Hardware
 - 3. Key Systems and Nomenclature
- C. ANSI - American National Standards Institute
 - 1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

1.04 SUBMITTALS

- A. General:
 - 1. Submit in accordance with Conditions of Contract and Division 01 requirements.
 - 2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
 - 3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.
- B. Action Submittals:
 - 1. Product Data: Technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
 - 2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
 - a. Wiring Diagrams: For power, signal, and control wiring and including:
 - 1) Details of interface of electrified door hardware and building safety and security systems.
 - 2) Schematic diagram of systems that interface with electrified door hardware.
 - 3) Point-to-point wiring.
 - 4) Risers.
 - 3. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.
 - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
 - 4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door

and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:

- a. Door Index; include door number, heading number, and Architects hardware set number.
- b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
- c. Quantity, type, style, function, size, and finish of each hardware item.
- d. Name and manufacturer of each item.
- e. Fastenings and other pertinent information.
- f. Location of each hardware set cross-referenced to indications on Drawings.
- g. Explanation of all abbreviations, symbols, and codes contained in schedule.
- h. Mounting locations for hardware.
- i. Door and frame sizes and materials.
- j. Name and phone number for local manufacturer's representative for each product.
- k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include operational descriptions for: egress, ingress (access), and fire/smoke alarm connections.
 - 1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.

5. Key Schedule:

- a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
- b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
- c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
- d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
- e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
 - 1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
- f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory or shop prepared for door hardware installation.

C. Informational Submittals:

1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
2. Product data for electrified door hardware:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

3. Certificates of Compliance:
 - a. UL listings for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
 - b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in "QUALITY ASSURANCE" article, herein.
 - c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.
4. Warranty: Special warranty specified in this Section.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Factory order acknowledgement numbers (for warranty and service)
 - d. Name, address, and phone number of local representative for each manufacturer.
 - e. Parts list for each product.
 - f. Final approved hardware schedule, edited to reflect conditions as-installed.
 - g. Final keying schedule
 - h. Copies of floor plans with keying nomenclature
 - i. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
 - j. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.05 QUALITY ASSURANCE

- A. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
 1. Warehousing Facilities: In Project's vicinity.
 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
 4. Coordination Responsibility: Assist in coordinating installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
 - a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.
- B. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
 1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
 2. Can provide installation and technical data to Architect and other related subcontractors.

3. Can inspect and verify components are in working order upon completion of installation.
 4. Capable of producing wiring diagrams.
 5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.
- C. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
- D. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
- E. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
- F. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.
- G. Keying Conference
1. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
 - a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Requirements for access control.
 - e. Address for delivery of keys.
- H. Pre-installation Conference
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. Inspect and discuss preparatory work performed by other trades.
 3. Inspect and discuss electrical roughing-in for electrified door hardware.
 4. Review sequence of operation for each type of electrified door hardware.
 5. Review required testing, inspecting, and certifying procedures.
- I. Coordination Conferences:
1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.
 2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.

- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
 - 1. Deliver each article of hardware in manufacturer's original packaging.
- C. Project Conditions:
 - 1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
 - 2. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Protection and Damage:
 - 1. Promptly replace products damaged during shipping.
 - 2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
 - 3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- F. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.07 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.08 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Beginning from date of Substantial Completion, for durations indicated.
 - a. Closers:
 - 1) Mechanical: 30 years.

- 2) Electrified: 2 years.
 - b. Automatic Operators: 2 years.
 - c. Exit Devices:
 - 1) Mechanical: 3 years.
 - 2) Electrified: 1 year.
 - d. Locksets:
 - 1) Mechanical: 3 years.
 - 2) Electrified: 1 year.
 - e. Continuous Hinges: Lifetime warranty.
 - f. Key Blanks: Lifetime
2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.09 MAINTENANCE

- A. Maintenance Tools: Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
 - 1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

- A. Fasteners
 - 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 - 2. Furnish screws for installation with each hardware item. 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 including prepared for paint surfaces to receive painted finish.

3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
 4. Install hardware with fasteners provided by hardware manufacturer.
- B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.
1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
 2. Use materials which match materials of adjacent modified areas.
 3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.
- C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.03 CONTINUOUS HINGES

A. Aluminum Geared

1. Manufacturers:
 - a. Scheduled Manufacturer: Ives.
 - b. Acceptable Manufacturers: Select, Stanley.
2. Requirements:
 - a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
 - b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
 - c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
 - d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
 - e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
 - f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
 - g. Install hinges with fasteners supplied by manufacturer.
 - h. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.04 ELECTRIC POWER TRANSFER

A. Manufacturers:

- a. Scheduled Manufacturer: Von Duprin EPT-10.
 - b. Acceptable Manufacturers: ABH PT1000, Securitron CEPT-10.
- B. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.
- C. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.05 FLUSH BOLTS

- A. Manufacturers:
- 1. Scheduled Manufacturer: Ives.
 - 2. Acceptable Manufacturers: Burns, Rockwood.
- B. Requirements:
- 1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.06 COORDINATORS

- A. Manufacturers:
- 1. Scheduled Manufacturer: Ives.
 - 2. Acceptable Manufacturers: Burns, Rockwood.
- B. Requirements:
- 1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
 - 2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

2.07 MORTISE LOCKS

- A. Manufacturers and Products:
- 1. Scheduled Manufacturer and Product: Schlage L9000 series.
 - 2. Acceptable Manufacturers and Products: Owner's Standard.
- B. Requirements:
- 1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3 hour fire doors.

2. Indicators: Where specified, provide indicator window measuring a minimum 2 inch x 1/2 inch with 180 degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
 - a. Inside Security Indicator: Provide indicator above cylinder or thumbturn for visibility during lockdown that identifies the outside trim as locked/unlocked status of the door.
 - b. Outside Status Indicator: Provide indicator above cylinder for visibility that identifies the outside trim as locked/unlocked status of the door.
 - c. Outside Occupancy Indicator: Provide indicator above cylinder or emergency release for visibility while operating the lock that identifies an occupied/unoccupied status of the lock or latch.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
 - a. Lever Design: Schlage 06A.
 - b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.08 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 99/33A series.
2. Acceptable Manufacturers and Products: Owner's Standard.

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide flush end caps for exit devices.
7. Provide exit devices with manufacturer's approved strikes.
8. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
9. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
10. Provide cylinder or hex-key dogging as specified at non fire-rated openings.

11. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
12. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
13. Provide electrified options as scheduled.
14. Top latch mounting: double or single tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
15. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.
 - a. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.09 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage/Von Duprin PS900 series.

B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:
 - a. 12/24 VDC Output, field selectable.
 - b. Class 2 Rated power limited output.
 - c. Universal 120-240 VAC input.
 - d. Low voltage DC, regulated and filtered.
 - e. Polarized connector for distribution boards.
 - f. Fused primary input.
 - g. AC input and DC output monitoring circuit w/LED indicators.
 - h. Cover mounted AC Input indication.
 - i. Tested and certified to meet UL294.
 - j. NEMA 1 enclosure.
 - k. Hinged cover w/lock down screws.
 - l. High voltage protective cover.

2.10 PERMANENT CORES

A. Manufacturers:

1. Scheduled Manufacturer: Best Lock Company
2. Acceptable Manufacturer: Owner's Standard

B. Requirements:

1. Provide interchangeable cores to match Owner's existing Best key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

C. Construction Keying:

1. Replaceable Construction Cores.
 - a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
 - 1) 3 construction control keys
 - 2) 12 construction change (day) keys.
 - b. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.11 KEYING

1. Provide permanent cores keyed into existing Best Lock Company factory registered keying system.

B. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

C. Requirements:

1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
 - a. Master Keying system as directed by the Owner.
2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
3. Provide keys with the following features:
 - a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
 - b. Patent Protection: Keys and blanks protected by one or more utility patent(s)
4. Identification:
 - a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Do not provide blind code marks with actual key cuts.
 - b. Identification stamping provisions must be approved by the Architect and Owner.
 - c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
 - d. Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
 - e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
5. Quantity: Furnish in the following quantities.
 - a. Change (Day) Keys: 3 per cylinder/core.
 - b. Permanent Control Keys: 3.

- c. Master Keys: 6.

2.12 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4010/4110 series.
2. Acceptable Manufacturers and Products: Owner's Standard

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Certify surface mounted mechanical closers to meet fifteen million (15,000,000) full load cycles. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 11/16 inch (17 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within 6-inch (152 mm) top rail without use of mounting plate so that closer is not visible through vision panel from pull side.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.13 ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4600 series.
2. Acceptable Manufacturers and Products: Owner's Standard

B. Requirements:

1. Provide low energy automatic operator units with hydraulic closer complying with ANSI/BHMA A156.19.
2. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
3. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door
4. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.

5. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check valve, sweep valve, latch valve to control door.
6. Provide drop plates, brackets, or adapters for arms as required for details.
7. Provide hard-wired actuator switches for operation as specified.
8. Provide weather-resistant actuators at exterior applications.
9. Provide key switches with LED's, recommended and approved by manufacturer of automatic operator as required for function described in operation description of hardware group below. Cylinders: Refer to "KEYING" article, herein.
10. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
11. Provide units with vestibule inputs that allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.14 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Rockwood.

B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

2.15 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Rockwood.

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.

2. Sizes of plates:
 - a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
 - b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
 - c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.16 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

- A. Manufacturers:
 1. Scheduled Manufacturers: Glynn-Johnson.
 2. Acceptable Manufacturers: Rixson, Sargent.
- B. Requirements:
 1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
 2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
 3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
 4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.17 DOOR STOPS AND HOLDERS

- A. Manufacturers:
 1. Scheduled Manufacturer: Ives.
 2. Acceptable Manufacturers: Burns, Rockwood.
- B. Provide door stops at each door leaf:
 1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
 2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
 3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.18 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

- A. Manufacturers:
 1. Scheduled Manufacturer: Zero International.
 2. Acceptable Manufacturers: National Guard, Reese.
- B. Requirements:

1. Provide thresholds, weather-stripping (including door sweeps, seals, and astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Size of thresholds:
 - a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
 - b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width
4. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.19 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Rockwood.

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.20 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer: Schlage.
2. Acceptable Manufacturers: GE-Interlogix, Sargent.

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.21 FINISHES

A. Finish: BHMA 626/652 (US26D); except:

1. Continuous Hinges: BHMA 628 (US28)
2. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
3. Protection Plates: BHMA 630 (US32D)
4. Overhead Stops and Holders: BHMA 630 (US32D)
5. Door Closers: Powder Coat to Match
6. Wall Stops: BHMA 630 (US32D)
7. Weatherstripping: Clear Anodized Aluminum
8. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
- C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Where on-site modification of doors and frames is required:
 - 1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
 - 2. Field modify and prepare existing door and frame for new hardware being installed.
 - 3. When modifications are exposed to view, use concealed fasteners, when possible.
 - 4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
 - a. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
 - b. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.03 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

- F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- H. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying section.
 - 2. Furnish permanent cores to Owner for installation.
- I. Wiring: Coordinate with Division 26, ELECTRICAL sections for:
 - 1. Conduit, junction boxes and wire pulls.
 - 2. Connections to and from power supplies to electrified hardware.
 - 3. Connections to fire/smoke alarm system and smoke evacuation system.
 - 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
 - 5. Testing and labeling wires with Architect's opening number.
- J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- L. Closer/holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- M. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
- N. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- O. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- P. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- Q. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- R. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.04 FIELD QUALITY CONTROL

- A. Engage qualified manufacturer trained representative to perform inspections and to prepare inspection reports.

1. Representative will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.05 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, Installer's Architectural Hardware Consultant must examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.06 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.07 DOOR HARDWARE SCHEDULE

- A. Hardware items are referenced in the following hardware. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.
- B. Hardware Sets:

Hardware Group No. 01

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 06A	626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		BES
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

Hardware Group No. 02

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	L9080HD 06A	626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		BES
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 03

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	L9080HD 06A	626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		BES
1	EA	SURFACE CLOSER	4111 CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

Hardware Group No. 04

1			HARDWARE BY DOOR MANUFACTURER		
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Hardware Group No. 05

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 06A	626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4011 ST-1544	689	LCN
1	EA	MOUNTING PLATE	4020-18 SRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

CLOSER INSTALLED PER ST-1544.

Hardware Group No. 06

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	L9040 06A 09-544 OS-OCC		626	SCH
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	4011 ST-1544		689	LCN
1	EA	MOUNTING PLATE	4020-18 SRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

CLOSER INSTALLED PER ST-1544.

Hardware Group No. 07

2	EA	CONT. HINGE	224HD EPT		628	IVE
2	EA	POWER TRANSFER	EPT10	⚡	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954		689	VON
1	EA	ELEC PANIC HARDWARE	LXRX-LC-EL-33A-EO 24 VDC	⚡	626	VON
1	EA	ELEC PANIC HARDWARE	LXRX-LC-EL-33A-NL-OP-388 24 VDC	⚡	626	VON
1	EA	SFIC MORTISE CYL.	80-132		626	SCH
1	EA	SFIC RIM CYLINDER	80-159		626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		626	BES
2	EA	90 DEG OFFSET PULL	8190EZHD 10" STD		626	IVE
2	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	SET	GASKETING	328AA-S		AA	ZER
2	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER
2	EA	DOOR CONTACT	679-05HM	⚡	BLK	SCE
1	EA	POWER SUPPLY	PS914 900-2RS 900-BBK 120/240 VAC	⚡		VON
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1			CARD READER - WORK OF DIVISION 28			
1			PROVIDE RISER DIAGRAMS			

ALL WIRING AND CONNECTIONS BY DIVISION 26.

OPERATIONAL DESCRIPTION:

DOORS TO BE NORMALLY CLOSED AND LOCKED. ACCESS BY KEY OR CARD READER. PRESENTATION OF VALID CREDENTIAL WILL RETRACT LATCHBOLT. DOOR CONTACT CONNECTED TO BUILDING'S SECURITY SYSTEM. FREE EGRESS AT ALL TIMES.

Hardware Group No. 08

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	L9040 06A 09-544 OS-OCC	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

Hardware Group No. 09

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 06A	626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		BES
1	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 10

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070HD 06A	626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	OH STOP	100S	630	GLY
1	EA	GASKETING	188SBK PSA	BK	ZER

Hardware Group No. 11

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	DBL CYL STORE LOCK	L9066HD 06A XL11-897	626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

Hardware Group No. 12

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050HD 06A 09-544	626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

Hardware Group No. 13

2	EA	CONT. HINGE	224HD	628	IVE
1	EA	CONST LATCHING BOLT	FB51T	630	IVE
1	EA	CLASSROOM SECURITY	L9071HD 06A	626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		BES
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	ASTRAGAL	8193AA	AA	ZER

Hardware Group No. 14

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM SECURITY	L9071HD 06A	626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

Hardware Group No. 15

2	EA	CONT. HINGE	224XY	628	IVE
2	EA	FIRE EXIT HARDWARE	9927-L-F-2SI-LBRAFL-06-499F	626	VON
4	EA	SFIC RIM CYLINDER	80-159	626	SCH
5	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
2	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7840 AS REQ (12/24/120V AC/DC TRI-VOLT) ↗	689	LCN
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	ASTRAGAL	8193AA	AA	ZER

Hardware Group No. 15A

2	EA	CONT. HINGE	224XY	628	IVE
2	EA	FIRE EXIT HARDWARE	9927-L-BE-F-4'-2SI-LBRAFL-06-499F	626	VON
2	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7840 AS REQ (12/24/120V AC/DC TRI-VOLT) ↗	689	LCN
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	ASTRAGAL	8193AA	AA	ZER

Hardware Group No. 16

2	EA	CONT. HINGE	224HD EPT	628	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
2	EA	ELEC FIRE EXIT HARDWARE	QEL-9927-EO-F-LBRAFL-499F 24 VDC	626	VON
2	EA	LONG DOOR PULL	9264F 48" STD	630-316	IVE
2	EA	FIRE/LIFE HOLDER	4040SEH AC/DC	689	LCN
2	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	ASTRAGAL	8193AA	AA	ZER
2	EA	DOOR BOTTOM	320AA	AA	ZER
1	EA	POWER SUPPLY	PS904 BBK 900-2RS 120/240 VAC	LGR	SCE
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS		
1			PROVIDE RISER DIAGRAMS		

Hardware Group No. 17

1	EA	CONT. HINGE	224HD EPT		628	IVE
1	EA	POWER TRANSFER	EPT10	↗	689	VON
2	EA	ELEC FIRE EXIT HARDWARE	QEL-99-NL-OP-F-110MD 24 VDC	↗	626	VON
1	EA	SFIC RIM CYLINDER	80-159		626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		626	BES
1	EA	LONG DOOR PULL	9264F 48" STD		630- 316	IVE
1	EA	FIRE/LIFE HOLDER	4040SEH AC/DC	↗	689	LCN
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
2	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR BOTTOM	320AA		AA	ZER
1	EA	POWER SUPPLY	PS904 BBK 900-2RS 120/240 VAC	↗	LGR	SCE
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1			PROVIDE RISER DIAGRAMS			

Hardware Group No. 18

2	EA	CONT. HINGE	224HD		628	IVE
2	EA	FIRE EXIT HARDWARE	9927-L-F-2SI-LBRAFL-06-499F		626	VON
4	EA	SFIC RIM CYLINDER	80-159		626	SCH
5	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		626	BES
2	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	ASTRAGAL	8193AA		AA	ZER

Hardware Group No. 19

1	EA	CONT. HINGE	224XY		628	IVE
1	EA	FIRE EXIT HARDWARE	99-L-F-2SI-06		626	VON
2	EA	SFIC RIM CYLINDER	80-159		626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED			BES
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	FIRE/LIFE WALL MAG	SEM7840 AS REQ (12/24/120V AC/DC TRI-VOLT)	↗	689	LCN
1	EA	GASKETING	188SBK PSA		BK	ZER

Hardware Group No. 20

1	EA	CONT. HINGE	224HD EPT		628	IVE
1	EA	POWER TRANSFER	EPT10	↗	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-LC-99-L-F-M996-06-FS	↗	626	VON
2	EA	SFIC RIM CYLINDER	80-159		626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED			BES
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR CONTACT	679-05HM	↗	BLK	SCE
1	EA	POWER SUPPLY	PS904 BBK 900-2RS 120/240 VAC	↗	LGR	SCE
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1			CARD READER - WORK OF DIVISION 28			
1			PROVIDE RISER DIAGRAMS			

Hardware Group No. 21

1	EA	CONT. HINGE	224HD		628	IVE
1	EA	CONT. HINGE	224HD EPT		628	IVE
1	EA	POWER TRANSFER	EPT10	↗	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-LC-99-L-F-M996-06-FS	↗	626	VON
2	EA	SFIC RIM CYLINDER	80-159		626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED			BES
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR CONTACT	679-05HM	↗	BLK	SCE
1	EA	POWER SUPPLY	PS904 BBK 900-2RS 120/240 VAC	↗	LGR	SCE
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1			CARD READER - WORK OF DIVISION 28			
1			PROVIDE RISER DIAGRAMS			

Hardware Group No. 22

1	EA	CONT. HINGE	224HD	628	IVE
1	EA	FIRE EXIT HARDWARE	99-L-F-2SI-06	626	VON
2	EA	SFIC RIM CYLINDER	80-159	626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		BES
1	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

Hardware Group No. 23

1	EA	CONT. HINGE	224HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	LXRX-LC-EL-99-NL-OP-110MD 24 VDC	626	VON
1	EA	SFIC RIM CYLINDER	80-159	626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		BES
1	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
1	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
1	SET	GASKETING	328AA-S	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A-223	A	ZER
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS904 BBK 900-2RS 120/240 VAC	LGR	SCE
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS		
1			CARD READER - WORK OF DIVISION 28		
1			PROVIDE RISER DIAGRAMS		

DOOR NORMALLY CLOSED AND LOCKED. FREE EGRESS AT ALL TIMES. ENTRY BY KEY OR BY REMOTE PUSHBUTTON RELEASE. PUSHBUTTON DESK CONSOLE LOCATED IN OFFICE 162 TO CONTROL DOORS SK165A AND SK-165B, CONSOLE LOATED IN OFFICE 121 TO CONTROL DOORS SK-120A AND SK-120B.

Hardware Group No. 24

1	EA	CONT. HINGE	112HD EPT		628	IVE
1	EA	POWER TRANSFER	EPT10	↗	689	VON
1	EA	ELEC PANIC HARDWARE	LXRX-LC-EL-33A-NL-OP-388 24 VDC	↗	626	VON
1	EA	SFIC RIM CYLINDER	80-159		626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		626	BES
1	EA	90 DEG OFFSET PULL	8190EZHD 10" STD		626	IVE
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	MOUNTING PLATE	4110-18 SRT		689	LCN
1	EA	BLADE STOP SPACER	4110-61 SRT		689	LCN
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER
1	EA	DOOR CONTACT	679-05HM	↗	BLK	SCE
1	EA	POWER SUPPLY	PS914 900-2RS 900-BBK 120/240 VAC	↗		VON
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1			CARD READER - WORK OF DIVISION 28			
1			PROVIDE RISER DIAGRAMS			
1			SEALS BY DOOR/FRAME SUPPLIER			

ALL WIRING AND CONNECTIONS BY DIVISION 26.

OPERATIONAL DESCRIPTION:

DOORS TO BE NORMALLY CLOSED AND LOCKED. ACCESS BY KEY OR CARD READER. PRESENTATION OF VALID CREDENTIAL WILL RETRACT LATCHBOLT. DOOR CONTACT CONNECTED TO BUILDING'S SECURITY SYSTEM. FREE EGRESS AT ALL TIMES.

Hardware Group No. 25

1	EA	CONT. HINGE	224HD		628	IVE
1	EA	PANIC HARDWARE	CD-99-NL-OP-110MD		626	VON
1	EA	SFIC RIM CYLINDER	80-159		626	SCH
1	EA	SFIC RIM CYLINDER	80-159		626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		626	BES
1	EA	90 DEG OFFSET PULL	8190EZHD 10" STD		626	IVE
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	SET	GASKETING	328AA-S		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER

Hardware Group No. 26

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 06A	626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	630	VON
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	MOTION SENSOR	SCANII 12/24 VDC	BLK	SCE
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS		
1			CARD READER - WORK OF DIVISION 28		

DOOR AND FRAME SUPPLIER TO PREP FOR AD LOCK AS REQUIRED.

Hardware Group No. 27

1	EA	CONT. HINGE	224HD	628	IVE
1	EA	CLASSROOM SECURITY	L9071HD 06A	626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	FIRE/LIFE WALL MAG	SEM7840 AS REQ (12/24/120V AC/DC TRI-VOLT)	689	LCN
1	EA	GASKETING	188SBK PSA	BK	ZER

Hardware Group No. 28

2	EA	CONT. HINGE	224HD	628	IVE
1	EA	CONST LATCHING BOLT	FB51T	630	IVE
1	EA	STOREROOM LOCK	L9080HD 06A	626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		BES
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	ASTRAGAL	8193AA	AA	ZER

Hardware Group No. 29

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	ELEC CLASSROOM LOCK	AD-400-MS-70-MT-RHO-B 4AA ⚡ BATTERY	626	SCE
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

AD LOCK TO BE PROVIDED BY DIVISION 28.
DOOR AND FRAME SUPPLIER TO PREP FOR AD LOCK AS REQUIRED.

Hardware Group No. 30

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	ELEC CLASSROOM LOCK	AD-400-MS-70-MT-RHO-B 4AA ⚡ BATTERY	626	SCE
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	FIRE/LIFE HOLDER	4040SEH AC/DC ⚡	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

RE-USE EXISTING AD LOCK.
DOOR AND FRAME SUPPLIER TO PREP FOR AD LOCK AS REQUIRED.

Hardware Group No. 31

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	ELEC CLASSROOM LOCK	AD-400-MS-70-MT-RHO-B 4AA ⚡ BATTERY	626	SCE
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

AD LOCK TO BE PROVIDED BY DIVISION 28.
DOOR AND FRAME SUPPLIER TO PREP FOR AD LOCK AS REQUIRED.

Hardware Group No. 32

1	EA	PIVOT SET	7255 SET	626	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	L9040 06A 09-544 OS-OCC	626	SCH
1	EA	RESCUE HARDWARE	455 - SIZE AS REQUIRED	630	HAG
1	EA	CONCEALED CLOSER	6030 BUMP WMS	689	LCN
1	EA	KICK PLATE	8400 18" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
2	EA	EDGE GASKETING	369AP	AL	PEM

Hardware Group No. 33

1	EA	CONT. HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	L9080HD 06A	626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	328AA-S	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A-223	A	ZER

Hardware Group No. 34

1	EA	CONT. HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	L9080HD 06A	626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
1	SET	GASKETING	328AA-S	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A-223	A	ZER

Hardware Group No. 35

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	L9080HD 06A		626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		626	BES
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	↗	630	VON
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	4011 ST-1544		689	LCN
1	EA	MOUNTING PLATE	4020-18 SRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE
1	EA	DESK MOUNT BUTTON	660-PB	↗	628	SCE
1	EA	DOOR CONTACT	679-05HM	↗	BLK	SCE
1	EA	MOTION SENSOR	SCANII 12/24 VDC	↗	BLK	SCE
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1			PROVIDE RISER DIAGRAMS			

CLOSER INSTALLED PER ST-1544.

Hardware Group No. 36

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	L9080HD 06A		626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		626	BES
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	↗	630	VON
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE
1	EA	DESK MOUNT BUTTON	660-PB	↗	628	SCE
1	EA	DOOR CONTACT	679-05HM	↗	BLK	SCE
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1			PROVIDE RISER DIAGRAMS			

Hardware Group No. 37

2	EA	CONT. HINGE	224HD	628	IVE
1	EA	CONST LATCHING BOLT	FB51T	630	IVE
1	EA	STOREROOM LOCK	L9080HD 06A	630	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		BES
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4111 SCUSH SRI	689	LCN
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	ASTRAGAL	8193AA	AA	ZER

Hardware Group No. 38

2	EA	CONT. HINGE	224HD	628	IVE
2	EA	FIRE EXIT HARDWARE	9927-L-F-LBRAFL-06-499F	626	VON
2	EA	SFIC RIM CYLINDER	80-159	626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
2	EA	SURFACE CLOSER	4111 EDA SRI	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	ASTRAGAL	8193AA	AA	ZER

Hardware Group No. 39

1	EA	CONT. HINGE	224HD	628	IVE
1	EA	FIRE EXIT HARDWARE	99-L-F-2SI-06	626	VON
2	EA	SFIC RIM CYLINDER	80-159	626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4111 EDA SRI	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

Hardware Group No. 40

1	EA	CONT. HINGE	224HD EPT		628	IVE
1	EA	POWER TRANSFER	EPT10	↗	689	VON
2	EA	CYLINDER	IC CYLINDER AS REQUIRED			SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		626	BES
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	↗	630	VON
1	EA	SURFACE CLOSER	4111 SCUSH SRI		689	LCN
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR CONTACT	679-05HM	↗	BLK	SCE
1	EA	MOTION SENSOR	SCANII 12/24 VDC	↗	BLK	SCE
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1			CARD READER - WORK OF DIVISION 28			
1			PROVIDE RISER DIAGRAMS			

Hardware Group No. 41

1	EA	CONT. HINGE	224HD		628	IVE
1	EA	FIRE EXIT HARDWARE	99-L-BE-F-2SI-06		626	VON
1	EA	SURFACE CLOSER	4111 EDA SRI		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 42

1	EA	CONT. HINGE	224HD		628	IVE
1	EA	OFFICE/ENTRY LOCK	L9050HD 06A 09-544		630	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		626	BES
1	EA	SURFACE CLOSER	4011 SRI		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 43

1	EA	CONT. HINGE	224HD		628	IVE
1	EA	STOREROOM LOCK	L9080HD 06A		630	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED			BES
1	EA	SURFACE CLOSER	4111 EDA SRI		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 44

1	EA	CONT. HINGE	224HD	628	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	L9040 06A 09-544 OS-OCC	630	SCH
1	EA	SURFACE CLOSER	4011 SRI	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 45

1	EA	CONT. HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	L9080HD 06A	630	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4011 SRI	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 46

1	EA	CONT. HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	L9080HD 06A	630	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4111 SCUSH SRI	689	LCN
1	SET	GASKETING	328AA-S	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A-223	A	ZER

Hardware Group No. 47

1	EA	CONT. HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	L9080HD 06A	630	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4011 SRI ST-1544	689	LCN
1	EA	MOUNTING PLATE	4020-18 SRT	689	LCN
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 48

2	EA	CONT. HINGE	224HD EPT		628	IVE
2	EA	POWER TRANSFER	EPT10	↗	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954		689	VON
1	EA	ELEC PANIC HARDWARE	LXRX-LC-EL-33A-EO 24 VDC	↗	626	VON
1	EA	ELEC PANIC HARDWARE	LXRX-LC-EL-33A-NL-OP-388 24 VDC	↗	626	VON
1	EA	SFIC MORTISE CYL.	80-132		626	SCH
1	EA	SFIC RIM CYLINDER	80-159		626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		626	BES
2	EA	90 DEG OFFSET PULL	8190EZHD 10" STD		626	IVE
2	EA	SURFACE CLOSER	4111 SCUSH SRI		689	LCN
1	SET	GASKETING	328AA-S		AA	ZER
2	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER
2	EA	DOOR CONTACT	679-05HM	↗	BLK	SCE
1	EA	POWER SUPPLY	PS914 900-2RS 900-BBK 120/240 VAC	↗		VON
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1			CARD READER - WORK OF DIVISION 28			
1			PROVIDE RISER DIAGRAMS			

ALL WIRING AND CONNECTIONS BY DIVISION 26.

OPERATIONAL DESCRIPTION:

DOORS TO BE NORMALLY CLOSED AND LOCKED. ACCESS BY KEY OR CARD READER. PRESENTATION OF VALID CREDENTIAL WILL RETRACT LATCHBOLT. DOOR CONTACT CONNECTED TO BUILDING'S SECURITY SYSTEM. FREE EGRESS AT ALL TIMES.

Hardware Group No. 49

2	EA	CONT. HINGE	224HD EPT		628	IVE
2	EA	POWER TRANSFER	EPT10	↗	689	VON
2	EA	ELEC FIRE EXIT HARDWARE	9927-L-F-LBRAFL-M996-06- 499F-FS	↗	626	VON
2	EA	SFIC RIM CYLINDER	80-159		626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		626	BES
2	EA	SURFACE CLOSER	4111 SCUSH SRI		689	LCN
1	EA	GASKETING	488SBK PSA		BK	ZER
2	EA	DOOR CONTACT	679-05HM	↗	BLK	SCE
1	EA	POWER SUPPLY	PS904 BBK 900-2RS 120/240 VAC	↗	LGR	SCE
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1			CARD READER - WORK OF DIVISION 28			
1			PROVIDE RISER DIAGRAMS			

Hardware Group No. 50

1	EA	CYLINDER	IC CYLINDER AS REQUIRED			SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		626	BES
1			HARDWARE BY DOOR MANUFACTURER			

Hardware Group No. 51

1	EA	CONT. HINGE	224HD EPT		628	IVE
1	EA	POWER TRANSFER	EPT10	↗	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-LC-99-L-F-M996-06-FS	↗	626	VON
1	EA	SFIC RIM CYLINDER	80-159		626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED			BES
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR CONTACT	679-05HM	↗	BLK	SCE
1	EA	POWER SUPPLY	PS904 BBK 900-2RS 120/240 VAC	↗	LGR	SCE
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1			CARD READER - WORK OF DIVISION 28			
1			PROVIDE RISER DIAGRAMS			

Hardware Group No. 52

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	ELEC CLASSROOM LOCK	AD-400-MS-70-MT-RHO-B 4AA ⚡	626	SCE
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

RE-USE EXISTING AD LOCK.
DOOR AND FRAME SUPPLIER TO PREP FOR AD LOCK AS REQUIRED.

Hardware Group No. 53

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	L9080HD 06A	626	SCH
1	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR CONTACT	679-05HM ⚡	BLK	SCE
1	EA	MOTION SENSOR	SCANII 12/24 VDC ⚡	BLK	SCE
1	EA	PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1		CARD READER - WORK OF DIVISION 28			
1		PROVIDE RISER DIAGRAMS			

Hardware Group No. 54

3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	L9080HD 06A		626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		626	BES
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	↗	630	VON
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR CONTACT	679-05HM	↗	BLK	SCE
1	EA	MOTION SENSOR	SCANII 12/24 VDC	↗	BLK	SCE
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1			CARD READER - WORK OF DIVISION 28			
1			PROVIDE RISER DIAGRAMS			

Hardware Group No. 55

2	EA	CONT. HINGE	224HD		628	IVE
2	EA	FIRE EXIT HARDWARE	9927-EO-F-LBRAFL-499F		626	VON
2	EA	SURFACE CLOSER	4111 EDA		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7840 AS REQ (12/24/120V AC/DC TRI-VOLT)	↗	689	LCN
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	ASTRAGAL	8193AA		AA	ZER

Hardware Group No. 55A

2	EA	CONT. HINGE	224HD		628	IVE
2	EA	FIRE EXIT HARDWARE	9927-EO-F-4'-LBRAFL-499F		626	VON
2	EA	SURFACE CLOSER	4111 EDA		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7840 AS REQ (12/24/120V AC/DC TRI-VOLT)	↗	689	LCN
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	ASTRAGAL	8193AA		AA	ZER

Hardware Group No. 56

2	EA	POWER TRANSFER	EPT10	⚡	689	VON
2	EA	ELEC FIRE EXIT HARDWARE	QEL-9927-L-F-LBRAFL-06- 499F 24 VDC	⚡	626	VON
2	EA	SFIC RIM CYLINDER	80-159		626	SCH
2	EA	PERMANENT CORE	BEST PERMANENT CORE AS REQUIRED		626	BES
2	EA	DOOR CONTACT	679-05HM	⚡	BLK	SCE
1	EA	POWER SUPPLY	PS904 BBK 900-2RS 120/240 VAC	⚡	LGR	SCE
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1			CARD READER - WORK OF DIVISION 28			
1			PROVIDE RISER DIAGRAMS			
1			RE-USE BALANCE OF DOOR, FRAME & HARDWARE			

PATCH, PREP AND REPAIR EXISTING DOOR AND FRAME FOR NEW HARDWARE AS REQUIRED.

Hardware Group No. 57

1	EA	CONT. HINGE	224HD EPT		628	IVE
1	EA	POWER TRANSFER	EPT10	⚡	689	VON
1	EA	ELEC PANIC HARDWARE	LD-LXRX-LC-33A-EO	⚡	626	VON
1	EA	SURFACE CLOSER	4111 SCUSH SRI		689	LCN
1	SET	GASKETING	328AA-S		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER
1	EA	DOOR CONTACT	679-05HM	⚡	BLK	SCE
1	EA		PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS			
1			PROVIDE RISER DIAGRAMS			

ALL WIRING AND CONNECTIONS BY DIVISION 26.

OPERATIONAL DESCRIPTION:

DOORS TO BE NORMALLY CLOSED AND LOCKED.

FREE EGRESS AT ALL TIMES.

DOOR TO BE EXIT ONLY

Door Numbers	HwSet#
P101	46
P102	37
P103	37
P104	07
P105	51
P105A	22
P105B	47
101	54

Door Numbers	HwSet#
101A	54
102	13
102G	21
106	53
106A	08
106B	08
106C	08
106D	09
107A	06
107B	06
113	18
113A	15
113B	20
113C	04
113D	04
113E	04
122	27
122A	05
123	27
125	52
125A	32
125B	11
125C	02
126	29
126A	02
126B	10
126C	02
138	14
138A	01
138B	31
138E	14
138F	14
139A	50
140	03
140A	08
140B	08
141	18
141A	24
141A.1	36
141B	35
141C	12
141D	12
141E	12
142	16
142A	16
142B	17
142C	17
144	27

Door Numbers	HwSet#
145	27
146	30
146A	12
146B	01
146C	12
146D	12
148	12
148A	12
148B	03
151	08
152	08
176	56
177	27
193A	33
199C	01
P201	49
P201A	57
P202	42
P205	49
P205A	39
P206	48
P206A	48
P206B	50
P207	44
P208	44
P209	45
P210	37
P211	37
P212	42
P212A	44
221A	55A
221B	15A
229	27
232	27
237	01
262	08
263	08
263A	01
276A	43
276C	39
276D	39
281A	28
281B	38
281C	19
281E	15
281F	41
282	55
283	40

Door Numbers	HwSet#
285C	09
286	41
E301	34
BG-B001	26
BG-B002	25
BG-B003	25
BG-B004	23
BG-B005	23
BG-B006	23
BG-B007	23
BG-B008	25
BG-B009	25
K8-148A	06

END OF SECTION 08 71 00

SECTION 08 80 00 - 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 glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows
 - 2. Doors
 - 3. Storefront framing and curtain wall framing.
 - 4. Interior borrowed lites.
 - 5. Glass at railings at spectator seating.

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. Interspace: Space between lites of an insulating-glass unit.

1.4 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. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:
 - 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Basic Wind Speed: 120 mph
 - b. Importance Factor: 1.15
 - c. Exposure Category: C

2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
 3. 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, whichever is less.
 4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.5 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
 1. Insulated glass.
 2. Fire rated glass.
 3. Non-Insulated glass.
- C. Glazing Accessory Samples: For gaskets, in 12-inch lengths.
- D. Qualification Data: For installers.
- E. Product Certificates: For glass and glazing products, from manufacturer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass and insulating glass.
 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- G. Preconstruction adhesion and compatibility test report.
- H. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. 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.

- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. Source Limitations for Glass: Obtain tinted float glass and insulating glass from single source from single manufacturer for each glass type.
- F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA's "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."
- H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- J. Preinstallation 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.

1.7 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 recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 PROJECT 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 below 40 deg F.

1.9 WARRANTY

- A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which 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 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- 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 monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 3. 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.
 4. 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.
 5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I of kind and condition indicated on drawings.
1. Manufacturer
 - a. Guardian
 - b. PPG
 - c. Viracon
 2. Types:
 - a. Clear
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated on drawings.
1. Types:
 - a. Clear
 2. Manufacturer:
 - a. Guardian
 - b. PPG
 - c. Viracon
 3. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 4. For uncoated glass, comply with requirements for Condition A.
 5. For coated vision glass, comply with requirements for Condition C (other coated glass).
- C. Fire Rated Glass: Doors shall be tested in accordance with ASTM E2074-00, NFPA, 252 Standard Test Method of Fire of Door Assemblies.
1. Basis of Design Product: Safti First (or Equal); Superclear 45; Superlite 11–XL60; Superlite 11–XL90; refer to Drawings for required rating.
 2. Light Transmission Rating: 85%.
 3. Glazing materials shall be optically clear, colorless and free from visual distortion.
 4. Each piece of fire rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory, fire rating period and safety glazing standards.
 5. Glazing Accessories: Glazed with EPDM tape or other listed flame resistant gasket materials and calcium silicate setting blocks.

D. Translucent Glazing Units (See specification 08 80 01)

1. Product: Solera S R5 + Aerogel.

- a. Manufacturer:
 Advanced Glazing Ltd.
 P. O. Box 1460
 Station A
 Sydney
 Nova Scotia
 BIP6R7

E. Glass at railing at spectator seating.

1. Securivue Laminated Glass (Syracuse Glass Company): Total nominal thickness is 13/16" tempered and laminated glass with polished edges and corners.
- a. 3/8" Fully clear tempered outboard
 b. 0.60" PVB interlayer
 c. 3/8" Fully clear tempered inboard
2. Glass Shoe: CR Laurence Cat #9BL21D
 3. Utilize taper set systems CRL CAT #LTL10X-1.
 4. Utilize rubber gasket CRL CAT #LBSG.

2.3 INSULATING GLASS

A. Manufacturers: Subject to compliance with requirements:

1. PPG –Solarban 60 (#2 Surface)
 2. Viracon –to match Solarban 60 (#2 Surface)
 3. Guardian – Sunguard SN68

B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
 2. Spacer: Manufacturer's standard spacer material and construction
 3. Desiccant: Molecular sieve or silica gel, or blend of both.

C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.

2.4 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C 864.

2. EPDM complying with ASTM C 864.
3. Silicone complying with ASTM C 1115.
4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.5 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will 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. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; 890.
 - b. Sika Corporation, Construction Products Division; SikaSil-C990.
 - c. Tremco Incorporated; Spectrem 1.

2.6 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, 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.

2.7 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.
- 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.

2.8 INSULATING-GLASS TYPES

- A. Glass Type: Low-e-coated, Argon Gas filled insulating glass.
 1. Exterior lite – 1 /4” thick, clear color, tempered glass, with a surface coating of Solarban 60 or Sunguard SM68 on the number 2 surface.
 2. Air Space of 1 /2” (argon filled).
 3. Interior lite – 1 /4” thick, clear color, tempered glass.
 - a. Technofoam Spacer.

2.9 MONOLITHIC-GLASS TYPES

- A. Glass Type: Fire rated glass. Superclear 45; Superlite 11-XL60; ; Superlite 11-XL90 by Safti First or VetroTech USA (or equal).
- B. Glass Type: Clear float glass and fully tempered float glass
 1. Thickness: 6.0 mm.
 2. Provide safety glazing labeling.

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 will 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. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. 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.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

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 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.

H. 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.

- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. 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.
- L. 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 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.

3.5 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.6 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

- C. 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; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project 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.

END OF SECTION 08 80 00

SECTION 08 80 01 – TRANSLUCENT GLAZING UNITS (TGU) SOLERA S R5 + AEROGEL

PART 1- GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Glass-Based Light Diffusing Insulating Glazing Units (TGUs)
- B. Related Sections:
 - 4. Section 08 80 00 - Glazing
 - 5. Section 08 44 13 - Glazed Curtainwall

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for TGU materials, including installation and maintenance instructions.
- B. Samples: Submit, for verification purposes, 12” X 12” samples of each type of TGU. TGU samples shall have manufacturer’s labels.
- C. Spectrophotometer test results: Submit, for possible warranty claim purposes, spectrophotometer test results for TGU units shipped to site.

1.03 QUALITY ASSURANCE

- A. [Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.]
- B. [Glazing Standards: Comply with recommendations of Insulating Glass Manufacturers Association (IGMA) except where more stringent requirements are indicated.]
- C. Industry standards for glass: ASTM C 1036-01 “Standard Specification for Flat Glass”, ASTM C 1048-04 “Standard Specification Heated Flat Glass _ndash Kind HS, Kind FT Coated and Uncoated Glass” .
- D. 16 CFR 1201 “Safety Standard for Architectural Glazing Materials”.
- E. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide glass produced by a single primary manufacturer for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

1.04 MULLION/FRAMING DESIGN

- A. Refer to specification 08 44 13 for Glazed Aluminum Curtain Walls.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect TGU during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass.

1.06 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

1.07 WARRANTY

- A. Submit TGU manufacturer's warranty against defects and workmanship for a period of ten (10) years from date of purchase, including:
 - 1. Discoloration of veil material by more than 2.0 ΔE (ASTM D 2244-02e1) (Reapproved 2005);
 - 2. Loss of light transmittance greater than 3%, determined according to manufacturer's technical data;
 - 3. Seal leakage;
 - 4. Substantial deterioration of insulating insert;
 - 5. Crushing or corrosion of spacer;
 - 6. Buildup of visible internal moisture.

PART 2 – PRODUCTS

2.01 ACCEPTABLE TRANSLUCENT GLAZING UNIT MANUFACTURERS

- A. Advanced Glazings Limited, P.O. Box 1460 Station "A", Sydney, N.S. Canada, B1P 6R7, phone (902)794-2899, email info@advancedglazings.com

2.02 TRANSLUCENT GLAZING UNITS (TGU)

- A. TGU Design and Appearance:
 - 1. The Translucent Glazing Unit shall be of a design such as to present a monolithic glass section without visible internal framing, support or other solid member inside of the perimeter spacer. The ability to use nearly any type or manufacture of architectural flat glass shall enable the visual integration of translucent surfaces with those of nearby vision glass as well as ensuring that the appearance of the translucent glazing surfaces does not deteriorate over the life of the building. The

employment of separate technologies for thermal insulation and light diffusion shall be such as to ensure that different thermal insulation specifications do not affect light transmission.

B. TGU Description:

1. Air filled preassembled units consisting of:
 - a. Two lites of glass;
 - b. Honeycomb transparent insulation core aligned perpendicular to glazing, filled with Aerogel, for TGU thermal insulation;
 - c. Translucent, non-woven veils permanently bonded to internal glass surfaces;
 - d. Continuous perimeter metal spacer bar separated from glass surfaces with foam thermal break;
 - e. Glass lites connected together with spacer bar using structural silicone sealant.
 - f. Airspace within TGU filled with air pressure equalized to atmospheric pressure with stainless steel capillary pressure equalization (vent) tube.
 - g. Glazing unit shall not contain in excess of .01 parts per million by weight each of Volatile Organic Compounds, asbestos, resorcinol-formaldehyde, pheono-resorcinol formaldehyde, urea formaldehyde, CFC, HFC, HCFC, Halon, Benzene, Cadmium (and compounds, Carbon tetrachloride, Cyanide (and compounds) Toluene, Xylenes, Lead. 1,1,1,Trichlorethane, Trichlorethylene, MEK, and MIK

2. Overall thickness and size:
 - a. Thickness: 1/2" plus glass lites.
 - b. Maximum overall size, edge of glass: 60" x 144" (1524mm X 3658mm)

3. Frame Compatibility: Solera S+Aerogel R5.
4. TGU performance
 - a. Thermal insulation (U-value): 0.2 (Btu/hr·ft²·°F)
 - b. Daylight transmittance: 37 %
 - c. Light Diffusion Power (LDP): excellent
 - d. Daylight to solar heat gain ratio: LSG=1.08
 - e. Solar heat gain coefficient (no shade): SHGC=0.34
 - f. Sound transmittance class (STC) (ASTM E 70-97): 35
 - g. Maximum color shift: [2 Δ E] over 5 years.
 - h. Flame spread (ASTM E 84-05e1): 5.
 - i. Smoke developed (ASTM E 84-054e1): 10.
 - j. Spacer resistance to crushing: 500 lbs/lineal Ft.

C. Glass:

1. Outboard lite: 6mm tempered Clear
2. Inboard lite: 6mm tempered Clear

D. Veil set:

- 1. 2xAGL402 exterior, AGL401 interior
- E. Spacer bar:
 - 1. Solera-R5
- F. Foam thermal break: minimum 1/32"(0.8mm).
- G. Capillary pressure equalization (vent) tube: stainless steel, diameter to allow for pressure equalization while also preventing uptake of particulate matter.
- H. Daylighting study: Visible light transmittance shall be as agreed upon between the Architect and the manufacturer and will be based on "Radiance" studies as provided by the manufacturer as a part of this work. Studies will demonstrate the improvement of light distribution and light levels from the use of diffuse light from translucent glazings. Study will include modelling results of light levels throughout the space to be analyzed. (Radiance is a program developed by Lawrence Berkeley National Laboratory.)

2.03 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES

- A. General: Provide products of type indicated and complying with following requirements:
 - 1. Glazing sealants and glazing tapes: to glazing frame manufacturer's standards.
 - 2. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
 - 3. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.
 - 4. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920-05 requirements, including those for Type, Grade, Class and Uses.
 - 5. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Owner's Representative from manufacturer's standard colors.

2.04 MISCELLANEOUS GLAZING MATERIALS

- A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Setting Blocks, Spacers: must be compatible with TGU sealant.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's written report, listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION:

- A. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings, which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3.03 GLAZING, GENERAL

- A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.
- B. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift TGU within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge that would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- D. Anchor components securely in place in manner indicated. Shim and allow for movement resulting from changes in thermal conditions. Provide separators and isolators to prevent corrosion, electrolytic deterioration, and "freeze-up" of moving joints.
- E. Glazing: Inspect glass and framing for compliance with manufacturing and installation tolerances, including size, squareness, and offsets at corners; for existence of minimum face or edge clearances; and for effective sealing of joinery.
 1. Avoid point loading of glass. Do not proceed with glazing work until unsatisfactory conditions have been corrected. Do not field-cut glass.
 2. Field-Glazed Structural Silicone Glazing Work: Clean frames and glass surfaces with an approved solvent. Prime surfaces and apply structural sealant in accordance with manufacturer's recommendations. Clean excess structural

sealant. Mechanically hold glass firmly in place until sealant is sufficiently cured. Install compressible backer rods in joint before applying weather seal sealant.

3.04 GLAZING

- A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6" from corner, unless otherwise required.
- B. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
- C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

3.05 PROTECTION AND CLEANING

- A. Remove non-permanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass manufacturer.
- D. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

END OF SECTION 08 80 00

SECTION 09 01 60 - HARDWOOD GYM FLOORING REFINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. This specification has been developed to insure the quality of design expected by the School District. Material manufacturers not listed should submit literature, physical samples and installation list of proposed product for review by the School District representative.
- B. Drawings and general provisions of Contract, including Division 01 General Requirements apply to this Specification.

1.2 SCOPE

- A. Sanding and refinishing of existing small auxiliary Gymnasium courts.
- B. Cutting and patching of existing gym floor at perimeter at new walls.
- C. Install new expansion base.

1.3 QUALITY ASSURANCE:

- A. Material supplier shall be a firm established in the industry.
- B. Flooring contractor shall be a company with a minimum of three (3) years continuous experience in the athletic flooring field. A list of at least three completed projects of similar magnitude and complexity where this work has been performed shall be submitted all with submittals/proposals. For each completed project owner references including contact information of a person with direct knowledge of the work shall be included.
 - 1. Approved installer – Basis of Design
Wayfare Sports Floors
Attn: Chris Smith
214 Kent Avenue
Endwell, NY 13760
(607) 321-3861
- C. Manufacturers wishing to gain prior approval shall request, in writing, the owner's qualification criteria.

1.4 SUBMITTALS:

- A. Submit three copies of manufacturer's product data.
- B. Samples: Provide physical samples for review.

- C. Maintenance Literature: Three copies of MFMA Care and Maintenance of wood floors.
- D. Certification: Manufacturer shall provide certification that all materials meet grade, quality and treatment if applicable.

1.5 DELIVERY, STORAGE AND HANDLING:

Materials shall not be delivered to the jobsite until all masonry, painting, plastering, tile work, work is complete. Where other trades are involved, all overhead mechanical work, lighting, backstops, and scoreboards shall be installed. Room temperature shall be 55-80 degrees and a consistent relative humidity maintained.

1.6 JOB CONDITIONS/SEQUENCE:

- A. Do not commence work until requirements listed in the previous paragraph are obtained.
- B. Permanent heat, light, and ventilation shall be operating and maintained during and following installation.
- C. After floors are finished, area is to be locked by School representative to allow time for curing of the finish. Owner shall protect finished floor until inspection and acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

- A. Hillyard
- B. Buckeye

2.2 Equal products from other manufacturers may be used in the work provided such products have been approved, by the Architect of record, not less than ten (10) days prior to scheduled bid opening.

2.3 Materials:

- A. GYM SEALER:
 - 1. Hillyard Courtgard Water Based Sealer
 - 2. Buckeye Coliseum 100 Oil-Modified Urethanes
- B. GYM FINISH:
 - 1. Hillyard Trophy H₂O Water Based Floor Finish
 - 2. Buckeye Arena 300 Water-Based Urethanes

3. Physical Characteristics:
 4. Gloss Level: (60°) 90+
 5. Solids: 30 + 1%
 6. Density: 8.5 lbs/gallon
 7. VOC: Does not exceed 450 grams per liter (3.8 pounds per gallon)
- C. GAME LINE PAINT: B COURTLINES Game line Paint is Acceptable Manufacturer's standard colors.
1. Sherwin Williams Industrial & Marine Enamel. Or Industrial & Marine Coatings DTM Acrylic.
 2. Benjamin Moore Impervo Alkyd High Gloss Enamel. Or Impervex Latex Hi-Gloss.
 3. Porter Glyptex Urethane Enamel.

PART 3 - EXECUTION

3.1 FLOOR INSPECTION:

- A. Inspect existing subfloor floor for proper dryness and tolerance and report any discrepancies to the owner's representative in writing. It is the intent of the owner to make necessary repairs where deficient materials are discovered. Any floor repair will be approved by the owner's representative prior to performance of the work. Additional cost associated with this floor repair shall be addressed with the flooring contractor via a Change Order using "unit cost" provided on the original bid form proposal.
- B. All floor repairs must be performed and complete prior to the refinishing of the maple flooring.

3.2 REFINISHING - Make sure floor is free of moisture.

- A. Sweep and vacuum floors clean.
- B. Remove all tape and gum with a putty knife or scraper.
- C. Sand with heavy, power driven type sander. Use dust accumulator on machine.
- D. Sand with No. 40 or 36 grit sandpaper if boards are uneven heights. First pass shall be on a diagonal angle to the direction of the floor.
- E. Make sure floor is sanded smooth and level before sanding with medium grit (50 or 60 grit) sandpaper. This cut and all subsequent cuts shall be sanded in the direction of the grain of the floor.
- F. Sand edges with No. 60 or 80 grit spinner paper.
- G. Sand entire floor with No. 80 or 100 grit sandpaper.
- H. Disk sand entire floor with No. 100 disk paper.
- I. Scrape and hand-sand corners and other areas not reached by machine.

- J. Clean floor to remove all dust and debris prior to sealing wood. Floor shall be smooth and free of shiners.

3.3 FINISHING:

- A. Tape off and protect all Volleyball Sleeve covers.
- B. Apply first coat of Hillyard Courtguard water-based sealer to the gym floor.
- C. Abrade gym floor with maroon pads (250 square feet per side of pad).
- D. Complete vacuum and preparation of the gym floor.
- E. Apply second coat of Hillyard Courtguard water-based sealer to the gym floor.
- F. Abrade gym floor with maroon pads (250 square feet per side of pad).
- G. Repaint all existing game lines and artwork.
- H. Abrade gym floor with maroon pads (250 square feet per side of pad).
- I. Complete vacuum and preparation of the gym floor.
- J. Apply one coat of Hillyard Courtguard water-based sealer to the gym floor.
- K. Apply one coat of Hillyard Trophy H2O water-based-based gym finish to the gym floor.
- L. Close doors and windows, turn off vent fans and Air Conditioning to avoid excess and direct air while coating.

3.4 PERIMETER MOLDING:

- A. Install vented rubber base at all walls with adhesive.
- B. Use pre-formed outside corners and neatly miter all inside corners.

3.5 CLEAN UP:

- A. Remove all sanding dust from job site.
- B. Clean and dust off all walls, doors and base trim before finish coats are applied.
- C. Clean and check the operation of all volleyball sleeve covers and any low voltage floor mounted boxes.

END OF SECTION 090160

SECTION 09 22 16 - 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. This Section includes non-load-bearing steel framing members for the following applications:
 - 1. Non-load-bearing steel framing systems for interior partitions.
 - 2. Suspension systems for interior ceilings and soffits.
 - 3. Grid suspension systems for gypsum board ceilings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Evaluation Reports: Submit evaluation reports certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98 accreditation criteria for inspection agencies.

1.4 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified in accordance with the product-certification program of the Steel Framing Industry Association (SFIA) or similar organization providing a verifiable code-compliance program.

1.5 PERFORMANCE REQUIREMENTS

- A. Design framing systems in accordance with AISI S220, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with AISI S220 requirements for metal, unless otherwise indicated.

2. Protective Coating: Comply with AISI S220; ASTM A 653, [G40 (Z120); or coating with equivalent corrosion resistance] [G60], hot-dip galvanized, unless otherwise indicated. Galvannealed products are unacceptable.
 - a. Coating to demonstrate equivalent corrosion resistance with an evaluation report acceptable to authorities having jurisdiction.

2.2 SUSPENSION SYSTEM COMPONENTS

- A. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.0625-inch diameter wire, or double strand of 0.0475-inch diameter wire.
- B. Wire Hangers: ASTM A 641, Class 1 zinc coating, soft temper, 0.162-inch diameter.
- C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.
 1. Depth: 2-1/2 inches.
- D. Furring Channels (Furring Members):
 1. Cold-Rolled Channels: 0.0538-inch base-steel thickness, with minimum 1/2-inch wide flanges, 3/4 inch deep.
 2. Steel Studs: AISI S220.
 - a. Product: ClarkDietrich; ProSTUD Drywall Framing System with Smart Edge technology or comparable product.
 - b. Minimum Base-Steel Thickness: [0.0150 inch] [0.0181 inch] [0.0296 inch] [0.0329 inch] [As indicated on Drawings].
 - c. Depth: As indicated on Drawings.
 3. Hat-Shaped, Rigid Furring Channels: AISI S220, 7/8-inch deep.
 - a. Product: ClarkDietrich; Furring Channel or comparable product.
 - b. Minimum Base Steel Thickness: As indicated on Drawings.
 4. Resilient Furring Channels: 1/2-inch deep members designed to reduce sound transmission.
 - a. Product: ClarkDietrich; RC Deluxe (RCSD) or comparable product.
 - b. Configuration: Asymmetrical or hat shaped.
- E. Grid Suspension System for Ceilings: AISI S220, direct-hung system composed of main beams and cross-furring members that interlock.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; 640-C Drywall Furring System.

- c. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Tracks: AISI S220.

1. Product: ClarkDietrich; ProSTUD Drywall Framing System with Smart Edge technology or comparable product.
2. Minimum Base-Steel Thickness: [0.0150 inch] [0.0181 inch] [0.0296 inch] [0.0329 inch] [As indicated on Drawings].
3. Depth: As indicated on Drawings.

B. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: AISI S220 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
2. Double-Runner System: AISI S220 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; m thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) ClarkDietrich; [MaxTrak](#) Slotted Deflection Track.
 - 2) Steel Network Inc. (The); VertiClip SLD Series.

C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Steel Thickness: 0.0296-inch.

D. Hat-Shaped, Rigid Furring Channels: AISI S220.

1. Minimum Base Steel Thickness: 0.0296-inch.
2. Depth: 7/8 inch.

E. Cold-Rolled Furring Channels: 0.0538-inch base-steel thickness, with minimum 1/2-inch wide flanges.

1. Depth: As indicated on Drawings.
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum base- steel thickness of 0.0296-inch.

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. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8-inch thick, in width to suit steel stud size.

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.
 - 1. 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, except comply with framing sizes and spacing indicated.
 - 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 SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- 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 permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 5. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. 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.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.

1. Space studs as follows:
 - a. Single-Layer Application: 16 inches
 - b. Multilayer Application: 16 inches, unless otherwise indicated.

- C. 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 two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

- D. Direct Furring:
 1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 09 22 16

SECTION 09 26 13 - GYPSUM VENEER PLASTERING

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. Gypsum veneer plaster and gypsum base for veneer plaster.
2. Gypsum veneer plaster over masonry surfaces.
3. Gypsum veneer plaster over monolithic concrete surfaces.

B. Related Requirements:

1. Section 09 22 16 "Non-Structural Metal Framing" for non-load-bearing steel framing.

1.3 ACTION SUBMITTALS

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

B. Shop Drawings:

1. Show locations, fabrication, and installation of control joints, reveals, and trim; include plans, elevations, sections, details of components, and attachments to other work.

C. Samples: For the following products:

1. Textured Finishes: Manufacturer's standard size for each textured finish and on rigid backing.

1.4 QUALITY ASSURANCE

- A. Mockups: Provide a full-thickness finish mockup for each type and finish of gypsum veneer plaster and substrate to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select representative surfaces and conditions for application of each type of gypsum veneer plaster and substrate.
2. Provide mockups of partitions in sizes of at least 100 sq. ft.

3. Apply gypsum veneer plaster, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 843 requirements or gypsum veneer plaster manufacturer's written recommendations, whichever are more stringent.
- B. Room Temperatures: Maintain not less than 55 deg F or more than 80 deg F for seven days before application of gypsum base and gypsum veneer plaster, continuously during application, and after application until veneer plaster is dry.
- C. Avoid conditions that result in gypsum veneer plaster drying too rapidly.
 1. Distribute heat evenly; prevent concentrated or uneven heat on veneer plaster.
 2. Maintain relative humidity levels, for prevailing ambient temperature, that produce normal drying conditions.
 3. Ventilate building spaces in a manner that prevents drafts of air from contacting surfaces during veneer plaster application until it is dry.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain gypsum veneer plaster products, including gypsum base for veneer plaster, joint reinforcing tape, and embedding material, from single manufacturer.

2.2 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.
- C. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 GYPSUM VENEER PLASTER

- A. Two-Component Gypsum Veneer Plaster (over CMU walls, concrete columns and where noted): ASTM C 587, with separate formulations; one for base-coat application and one for finish-coat application over substrates.
 - 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. National Gypsum Company:
 - 1) Base Coat: Kal-Kote Plaster Base.
 - 2) Smooth Finish Coat: Kal-Kote Smooth Finish.
 - b. USG Corporation:
 - 1) Base Coat: Diamond Veneer Basecoat Plaster.
 - 2) Smooth Finish Coat: Diamond Interior Finish Plaster.

2.4 JOINT REINFORCING MATERIALS

- A. General: Comply with joint strength requirements in ASTM C 587 and with gypsum veneer plaster manufacturer's written recommendations for each application indicated.
- B. Embedding Material for Joint Tape:
 - 1. Gypsum Base for Veneer Plaster: As recommended by gypsum veneer plaster manufacturer for use with joint-tape material and gypsum veneer plaster applications indicated.

2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced product standards and manufacturer's written recommendations.
- B. Bonding Agent: ASTM C 631, polyvinyl acetate.
- C. Patching Mortar: Dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

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. Masonry Substrates: Verify that mortar joints are struck flush.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Monolithic Concrete Substrates: Prepare according to gypsum veneer plaster manufacturer's written recommendations and as follows:
 - 1. Clean surfaces to remove dust, loose particles, grease, oil, incompatible curing compounds, form-release agents, and other foreign matter and deposits that could impair bond with gypsum veneer plaster.
 - 2. Remove ridges and protrusions greater than 1/8 inch and fill depressions greater than 1/4 inch with patching mortar. Allow to set and dry.
 - 3. Apply bonding agent on dry and cured concrete substrates.
- B. Masonry Substrates: Prepare according to gypsum veneer plaster manufacturer's written recommendations and as follows:
 - 1. Clean surfaces to remove dirt, grease, oil, and other foreign matter and deposits that could impair bond with gypsum veneer plaster.
 - 2. Apply bonding agent on dry masonry substrates.

3.3 GYPSUM VENEER PLASTERING

- A. Bonding Agent: Apply bonding agent on dry monolithic concrete masonry according to gypsum veneer plaster manufacturer's written recommendations.
- B. Gypsum Veneer Plaster Mixing: Mechanically mix gypsum veneer plaster materials to comply with ASTM C 843 and with gypsum veneer plaster manufacturer's written recommendations.
- C. Gypsum Veneer Plaster Application: Comply with ASTM C 843 and with veneer plaster manufacturer's written recommendations.
 - 1. One-Component Gypsum Veneer Plaster: Trowel apply base coat over substrate to uniform thickness. Fill all voids and imperfections. Immediately double back with same mixer batch of plaster to a uniform total thickness of 1/16 to 3/32 inch.
 - 2. Two-Component Gypsum Veneer Plaster:

- a. Base Coat: Hand trowel or machine apply base coat over substrate to a uniform thickness of 1/16 to 3/32 inch. Fill all voids and imperfections.
 - b. Finish Coat: Trowel apply finish-coat plaster over base-coat plaster to a uniform thickness of 1/16 to 3/32 inch.
3. Where gypsum veneer plaster abuts only metal door frames, windows, and other units, groove finish coat to eliminate spalling.
 4. Do not apply veneer plaster to gypsum base if paper facing has degraded from exposure to sunlight. Before applying veneer plaster, use remedial methods to restore bonding capability to degraded paper facing according to manufacturer's written recommendations and as approved by Architect.
- D. Gypsum Veneer Plaster Finish: Smooth-troweled finish unless otherwise indicated.

3.4 PROTECTION

- A. Protect installed gypsum veneer plaster from damage from weather, condensation, construction, and other causes during remainder of the construction period.

END OF SECTION 09 26 13

SECTION 09 29 00 - 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.

- B. Related Requirements:

- 1. Section 09 22 16 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
 - 2. Moisture / Mold Resistant Gypsum Board.
 - 3. Tile Backing Panels (at shower).

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.
- C. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

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 the following:
 1. Georgia-Pacific Gypsum LLC.
 2. National Gypsum Company.
 3. USG Corporation.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
 1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
- D. Gypsum Ceiling Board: ASTM C 1396.
 1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.

- E. Moisture / Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Core: 5/8 inch, Type X.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.4 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges.
 - 1. Manufacturers:
 - a. USG Glass Mat Tile Backer
 - b. National Gypsum Company
 - c. Gold Bond Tile Backer
 - 2. Core: 1/2 inch, regular type.
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
- B. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.
 - 1. Manufacturers:
 - a. USG Durock Cement Board
 - b. James Hardie – Hardie Backer Boards
 - c. PermaBASE Building Products LLC, by National Gypsum Company
 - 2. Thickness: 1/2 inch.
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized.
 - 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.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.

- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting-type, compound.
 - 4. Finish Coat: For third coat, use drying-type, 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. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 - 2. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 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 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. Thermal Insulation: As specified in Section 07 21 00 "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 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. 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-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-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. Moisture/Mold Resistant Gypsum Board (at Pool, Showers, Ceilings, Locker Rooms, Toilet Rooms and Janitors Closet).
- 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 vertically or horizontally 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.

3.4 INSTALLATION OF TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at [showers and where indicated on Drawings. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Cementitious Backer Units: ANSI A108.11, at showers and where indicated on Drawings.

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 at exposed panel edges.

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, 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 5: At panel surfaces that will be exposed to view, unless otherwise noted.
 - a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

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.

END OF SECTION 09 29 00

SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Porcelain tile.
2. Glazed wall tile.
3. Thresholds.
4. Tile backing panels.
5. Waterproof membranes.
6. Crack isolation membranes.
7. Setting material.
8. Grout materials.

B. Related Requirements:

1. Section 07 92 00 "Joint Sealants" for sealing of movement joints in tile surfaces.
2. Section 09 26 13 "Gypsum Veneer Plastering".
3. Section 09 29 00 "Gypsum Board".
4. Section 093413 "Tile for Swimming Pool & Pool Deck".

1.2 DEFINITIONS

- A. General: Definitions in ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. Face Size: Actual tile size, excluding spacer lugs.
- C. Large Format Tile: Tile with at least one edge 15 inches or longer.
- D. Module Size: Actual tile size plus joint width indicated.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 ACTION SUBMITTALS

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

- B. Shop Drawings: Show locations, plans, and elevations, of each type of tile and tile pattern. Show widths, details, and locations of movement joints in tile substrates and finished tile surfaces. Show thresholds.
- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection or shade variation.
- D. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
 - 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
 - 3. Full-size units of each type of trim and accessory for each color and finish required.
 - 4. Stone thresholds in 6-inch lengths.
 - 5. Metal flooring transitions 6-inch lengths.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product, including product use classification.
- D. Product Test Reports:
 - 1. Tile-setting and -grouting products.
 - 2. Certified porcelain tile.
 - 3. Slip-resistance test reports from qualified independent testing agency.
- E. Field Quality-Control Reports: Water test reports of membrane in wet areas.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials, from the same production run, to Owner that match 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.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is a Five-Star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
2. Installer's supervisor for Project holds the International Masonry Institute's Supervisor Certification.
3. Installer employs only Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers for Project.
4. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of mud floors, mud walls, membranes, shower receptors, and large format tile.

1.8 MOCKUPS

A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.
3. 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. 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.

1.10 FIELD 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.

1.11 WARRANTY

- A. System Warranty: Manufacturer's non-prorated comprehensive warranty that agrees to repair and replace defective installation areas, material, and labor that fail under normal usage within specified warranty period.

1. Warranty Period: 10 years from date of Product Purchase.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Tile: Obtain tile of each type and color or finish from single 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. Tiling System: Obtain system products from single manufacturer and each aggregate from single source or producer.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Laticrete International, Inc. (Basis of Design)
 - b. MAPEI Corporation.
 - c. Custom Building Products.
 - d. ARDEX Americas.
 2. Obtain setting and grouting materials, except for unmodified portland cement and aggregate, from single manufacturer.
 3. Obtain underlayment from manufacturer of setting and grouting materials.
 4. Obtain waterproof membrane, crack isolation, and other required membranes from manufacturer of setting and grouting materials.
 5. Obtain joint sealants from manufacturer of setting and grouting materials.
- C. Accessory Products: Obtain each of the following products specified in this Section from a single manufacturer:
 1. Stone thresholds.
 2. Backer units - waterproof membrane.
 3. Crack – isolation membrane.
 4. Joint sealants.

2.2 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 TCNA 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 swimming pools or 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.

2.3 TILE PRODUCTS

- A. Refer to “Room Finish Schedule” and “Finish Legend” of finish drawings in the construction documents.

2.4 PORCELAIN TILE

- A. Porcelain Tile Type: Refer to “Room Finish Schedule” and “Finish Legend” of finish drawings in the construction documents.

2.5 GLAZED WALL TILE

- A. Glazed Wall Tile Type: Refer to “Room Finish Schedule” and “Finish Legend” of finish drawings in the construction documents.

2.6 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 above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Granite Thresholds: ASTM C615/C615M with polished finish.
 - 1. Description:
 - a. Uniform, medium black stone without veining.
- C. Marble Thresholds: ASTM C503/C503M, with a minimum abrasion resistance of 12 in accordance with ASTM C1353/C1353M or ASTM C241/C241M and with honed finish.

1. Description:
 - a. Uniform, fine- to medium-grained white stone with gray veining.

2.7 TILE BACKING PANELS

- A. Cementitious Backer Units (at shower): ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges in maximum lengths available to minimize end-to-end butt joints.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Building Products.
 - b. PermaBASE Building Products, LLC provided by National Gypsum Company.
 - c. USG Corporation.
 2. Thickness: 1/2 inch.
 3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
- B. Water-Resistant Gypsum Backing Board: ASTM C1396/C1396M, with manufacturer's standard edges.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum.
 - b. Gold Bond Building Products, LLC provided by National Gypsum Company.
 - c. USG Corporation.
 2. Core: 5/8 inch, Type X.
- C. Glass-Mat, Water-Resistant Gypsum Panel: ASTM C1658/C1658M, with fiberglass mat partially or completely embedded into the core.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Georgia-Pacific Gypsum LLC.
 - b. Gold Bond Building Products, LLC provided by National Gypsum Company.
 - c. USG Corporation.
 2. Core: 5/8 inch, Type X 5/8 inch, abuse resistant.
 3. Long Edges: Tapered.
 4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

- D. Coated Glass-Mat, Water-Resistant Gypsum Backing Panel: ASTM C1178/C1178M, with a water-resistant coating on one surface, and manufacturer's standard edges.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed; SAINT-GOBAIN.
 - b. Georgia-Pacific Gypsum LLC.
 - c. USG Corporation.
 - 2. Core: 5/8 inch, Type X.
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.8 WATERPROOF MEMBRANES

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and ANSI A118.12 and is recommended by manufacturer for application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Waterproof Membrane, Fluid Applied: Liquid rubber polymer.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Laticrete International, Inc – Hydro Ban (Basis of Design)
 - b. ARDEX Americas.
 - c. Custom Building Products.
 - d. MAPEI Corporation.

2.9 CRACK ISOLATION MEMBRANES

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for standard performance and is recommended by manufacturer for application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Crack Isolation Membrane, Polyethylene Sheet: Polyethylene faced on both sides with polyester fabric.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. Schluter Systems L.P.

- C. Crack Isolation Membrane, Fluid Applied: Liquid-latex rubber or elastomeric polymer with continuous fabric reinforcement.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. Sika Corporation.

2.10 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset at locker showers)
 - 1. Laticrete 3701 Fortified Mortar Bed (thickset)
- B. Polymer Fortified Thinset Set Mortar: Exceeds ANSI A118.4, A118.11 and A118.15
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Laticrete International, Inc 254 Platinum (Basis of Design)
 - b. Custom Building Products.
 - c. MAPEI Corporation.
 - d. ARDEX Americas.

2.11 GROUT MATERIALS

- A. Water-Cleanable Epoxy Grout: ANSI A118.3.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Laticrete International, Inc. – Spectralock Pro Premium Grout (Basis of Design)
 - b. MAPEI Corporation.
 - c. Custom Building Products.

2.12 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting and adhesive materials for installations indicated.
- B. Metal Flooring Transitions: Profile designed specifically for flooring applications; height to match tile and setting-bed thickness.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Schluter Systems L.P.
 - b. Progress Profiles America Inc.
 - c. Blanke Corporation.
 - d. Dural USA, Inc.
 - e. Profilitec Corp.
2. Description: Refer to “Interior Finish Notes” of finish drawings in the construction document.
 3. Material and Finish: Metallic or combination of metal and PVC or neoprene base; polished chrome anodized aluminum, brushed chrome anodized aluminum, color-coated aluminum, satin anodized aluminum, brushed stainless steel (AISI 316) exposed-edge material.
- C. Metal Edge Trim: Profile designed for wall terminations and edge protection.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Schluter Systems L.P.
 - b. Progress Profiles America Inc.
 - c. Blanke Corporation.
 - d. Dural USA, Inc.
 - e. Profilitec Corp.
 2. Description: Refer to “Interior Finish Notes” of finish drawings in the construction document.
 3. Terminations: End caps, inside corners, outside corners matching edge-protection profile.
 4. Material and Finish: polished chrome anodized aluminum, brushed chrome anodized aluminum, color-coated aluminum, satin anodized aluminum, brushed stainless steel (AISI 316) exposed-edge material.
 5. Temporary Protective Coating: Formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products and easily removable after grouting is completed without damaging grout or tile.
- D. 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.
- E. Grout Sealer: Grout manufacturer's standard product for sealing grout joints that does not change color or appearance of grout.

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 the Work.

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.
2. Verify that concrete substrates for tile floors installed with adhesives, bonded mortar bed or thinset mortar comply with surface finish requirements in 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.
3. 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.
4. 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. Remove coatings, including curing compounds or other coatings, that are incompatible with tile-setting materials.
- B. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- C. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1 and is sloped 1/4 inch per foot toward drains.
- D. 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.
- E. Substrate Flatness:
 1. For tile shorter than 15 inches, confirm that structure or substrate is limited to variation of 1/4 inch in 10 ft. from the required plane, and no more than 1/16 inch in 12 inches when measured from tile surface high points.
 2. For large format tile, tile with at least one edge 15 inches or longer, confirm that structure or substrate is limited to 1/8 inch in 10 ft. from the required plane, and no more than 1/16 inch in 24 inches when measured from tile surface high points.
- F. 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 INSTALLATION OF CERAMIC TILE SYSTEM

- A. Install tile backing panels and treat joints in accordance with ANSI A108.11 and manufacturer's written instructions for type of application indicated.
- B. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
 - 1. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.
- C. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
 - 1. Allow crack isolation membrane to cure before installing tile or setting materials over it.
- D. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
 - 1. Add materials, water, and additives in accurate proportions.
 - 2. 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.
- E. Install tile in accordance with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of ANSI A108 series that are referenced in TCNA installation methods and specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - b. Tile swimming pool decks. (refer to Aquatics specs)
 - c. Tile floors consisting of tiles 8 by 8 inches or larger.
 - d. Tile floors consisting of rib-backed tiles.
 - 2. 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.
 - 3. 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.
 - 4. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
 - 5. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
 - 6. 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 use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

- a. 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.
 - b. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - c. 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.
7. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- F. Movement Joints: Provide movement joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated on Drawings. Form joints during installation of setting materials, mortar beds, and tile. Keep joints free of dirt, debris, and setting materials prior to filling with sealants. Do not saw-cut joints after installing tiles.
1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- G. Thresholds: Where indicated at “Floor Finish Plans” of finish drawings in the construction documents, 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 Laticrete 254 Platinum thinset.
- H. Metal Flooring Transitions: Install at locations indicated where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile, where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
- I. Metal Wall Trim: Install at locations indicated on Drawings. (Refer to Room Finish Schedule)
- J. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors in accordance with manufacturer's written instructions. As soon as sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 FIELD QUALITY CONTROL

A. Water Test:

1. Test of waterproofing membrane in showers and similar areas to be performed by Installation Contractor before setting tile.
 - a. Perform test after 24 hours of waterproof membrane installation.
 - b. Insert test plug in drain or waste line.
 - c. Fill shower base with water, high enough that the membrane-to-drain connection and floor-to-wall transition can be evaluated, and mark wall.

- d. Check for leaks after 24 hours.
2. Test to be witnessed by construction manager.
- B. Nonconforming Work:
 1. Waterproof membrane will be considered defective if water level has dropped.
 2. Remove and replace defective components and retest.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 1. Remove grout residue from tile as soon as possible.
 2. Clean grout smears and haze from tile in accordance with tile and grout manufacturer's written instructions. 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.

3.6 PROTECTION

- A. 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.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 1. TCNA F111: Method ANSI A108.1A, ANSI A108.1B, ANSI A108.1C. Cement mortar bed (thickset) installed over Laticrete Hydro Ban waterproofing.
 - a. Ceramic Tile Type: Refer to Room Finish Schedule.
 - b. Bond Coat for Cured-Bed Method: Laticrete 3701 Fortified Mortar Bed (thickset).
 - c. Grout: water cleanable epoxy grout.
 - d. Joint Width: per tile manufacturer recommendation.
 - e. Movement Joints: Types located on Drawings.

2. TCNA F125-Full: Thinset mortar on crack isolation membrane.
 - a. Ceramic Tile Type: Refer to Room Finish Schedule.
 - b. Thinset Mortar: Laticrete 254 Platinum.
 - c. Grout: Water-cleanable epoxy grout.
 - d. Crack Isolation Membrane: As recommended by setting material manufacturer.
 - e. Joint Width: per tile manufacturer recommendation.
 - f. Movement Joints: Types located on Drawings.

B. Interior Wall Installations, Masonry or Concrete:

1. TCNA W202I: Thinset mortar over waterproof membrane at shower.
 - a. Ceramic Tile Type: refer to Room Finish Schedule.
 - b. Thinset Mortar: Laticrete 254 Platinum.
 - c. Grout: Water-cleanable epoxy grout (Laticrete Spectralock Pro Premium Grout).
 - d. Waterproof Membrane: As recommended by setting material manufacturer, Fluid-applied membrane, Laticrete Hydro Ban.
 - e. Joint Width: per tile manufacturer recommendation.
 - f. Movement Joints: Types located on Drawings.

C. Interior Wall Installations, Metal Studs or Furring:

1. TCNA W245: Thinset mortar on glass-mat, water-resistant gypsum backer board over waterproof membrane – Hydro Ban.
 - a. Ceramic Tile Type: Refer to Finish Room Schedule.
 - b. Thinset Mortar: Laticrete 254 Platinum.
 - c. Grout: Water-cleanable epoxy grout (Laticrete Spectralock Pro Premium Grout).
 - d. Waterproof Membrane: Fluid-applied membrane – Laticrete Hydro Ban.
 - e. Joint Width: per tile manufacturer recommendation.
 - f. Movement Joints: Types located on Drawings.

D. Shower Wall Installations:

1. TCNA B419: Thinset mortar over waterproof membrane Hydro Ban on coated glass-mat, water-resistant gypsum backer board.
 - a. Ceramic Tile Type: Refer to Finish Room Schedule.
 - b. Thinset Mortar: Laticrete 254 platinum.
 - c. Grout: Water-cleanable epoxy grout (Laticrete Spectralock Pro Premium Grout).
 - d. Waterproof Membrane: Fluid-applied membrane – Laticrete Hydro Ban.
 - e. Joint Width: Per tile manufacturer recommendation.
 - f. Movement Joints: Types located on Drawings.

END OF SECTION 09 30 13

SECTION 09 50 00 - SUSPENDED METAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section Includes

1. Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes

1. Acoustical metal ceiling panels
2. Exposed grid suspension system
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
4. Perimeter Trim

Related Sections:

5. Section 09 29 00 - Gypsum Board
6. Section 09 51 13 - Acoustical Fabric-Faced Panel Ceilings
7. Divisions 23 - HVAC Air Distribution
8. Division 26 - Electrical

B. Alternates

1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products that have not been approved by Addenda, the specified products shall be provided without additional compensation.
2. Submittals that do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
 2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
 3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
 4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
 5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
 6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
 7. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
 8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
 9. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
 10. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems
 11. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
 12. ASTM E 1264 Classification for Acoustical Ceiling Products
- B. International Building Code
- C. ASHRAE Standard 62.1-2004 Ventilation for Acceptable Indoor Air Quality
- D. NFPA 70 National Electrical Code
- E. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
- F. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components
- G. International Code Council-Evaluation Services Report - Seismic Engineer Report
1. ESR 1308 - Armstrong Suspension Systems
- H. International Association of Plumbing and Mechanical Officials - Seismic Engineer Report
1. 0244 - Armstrong Single Span Suspension System
- I. International Well Building Standard
- J. Mindful Materials
- K. Living Building Challenge
- L. U.S. Department of Agriculture BioPreferred program (USDA BioPreferred).

1.4 SYSTEM DESCRIPTION

- A. Discontinuous/Open Plenum

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
- B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.
- C. Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with or supported by the ceilings.
- D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
- E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
- B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 - 1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.
- C. Acoustic Panels: As with other architectural features located at the ceiling, may obstruct or skew the planned fire sprinkler water distribution pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection engineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.
- D. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.8 PROJECT CONDITIONS

A. Space Enclosure:

- 1. Standard Ceilings: Do not install interior ceilings until space is enclosed and weatherproof; wet work in place is completed and nominally dry; work above ceilings is complete; and ambient conditions of temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.
- 2. HumiGuard Plus Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Products with HumiGuard Plus performance and hot dipped galvanized steel, aluminum or stainless steel suspension systems can be installed up to 120°F and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.
- 3. HumiGuard Max Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Ceilings with HumiGuard Max performance can be installed in conditions up to 120°F and maximum humidity exposure including outdoor applications, and other standing water applications, so long as they are installed with either SS Prelude Plus, AL Prelude Plus, or Prelude Plus Fire Guard XL suspension systems. Products with HumiGuard Max performance can be installed in exterior applications, where standing water is present, or where moisture will come in direct contact with the ceiling. Only Ceramaguard with AL Prelude Plus suspension system can be installed over swimming pools.

1.9 WARRANTY

- A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:
 - 1. Acoustical Panels: Sagging and warping.
 - 2. Grid System: Rusting and manufacturer's defects.
- B. Warranty Period:
 - 1. Acoustical Metal panels: Ten (10) years from date of substantial completion.
 - 2. Grid: Ten (10) years from date of substantial completion.

- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.10 MAINTENANCE

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
 - 1. Acoustical Metal Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
 - 2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Metal Ceiling Panels:
 - 1. Armstrong World Industries, Inc.
 - 2. Armstrong Ceilings Rep:
 - a. Benjamin Hinkle (bmhinkle@armstrongceilings.com / 717-719-3764)
- B. Suspension Systems:
 - 1. Armstrong World Industries, Inc.
 - 2. Armstrong Ceilings Rep:
 - a. Benjamin Hinkle (bmhinkle@armstrongceilings.com / 717-719-3764)
- C. Aluminum Custom Trims:
 - 1. Armstrong World Industries, Inc.
 - 2. Armstrong Ceilings Rep:
 - a. Benjamin Hinkle (bmhinkle@armstrongceilings.com / 717-719-3764)

2.2 ACOUSTICAL CEILING UNITS

- A. Acoustical Panels
 - 1. Panel Type A: 8455H1516PT – 45 degree Arc – 2x4 panels – 4STR Perimeter Trim
 - a. Surface Texture: Smooth
 - b. Composition: Metal

- c. Color: MY – “Gun Metal Grey”
 - d. Size: 24”x48” – See drawings for panel layout / configuration
 - e. Edge Profile: Square 15/16"
 - f. Perforation Option: R125
 - g. Noise Reduction Coefficient (NRC): N/A
 - h. Ceiling Attenuation Class (CAC): N/A
 - i. Sabin: N/A
 - j. Articulation Class (AC): N/A
 - k. Flame Spread: ASTM E 1264; Class A.
 - l. Light Reflectance (LR) White Panel: ASTM E 1477; .
 - m. Dimensional Stability:
 - n. Recycle Content: N/A
 - o. Basis-of-Design Product: SERPENTINA Components, 845H No added formaldehyde as manufactured by Armstrong World.
2. Panel Type B: 845V1516PT – 45 degree Arc – 2x4 panels – 4STR Perimeter Trim
- a. Surface Texture: Smooth
 - b. Composition: Metal
 - c. Color: MY – “Gun Metal Grey”
 - d. Size: 24" x 48" – See drawings for panel layout / configuration
 - e. Edge Profile: Square 15/16"
 - f. Perforation Option: R125
 - g. Noise Reduction Coefficient (NRC): N/A
 - h. Ceiling Attenuation Class (CAC): N/A
 - i. Sabin: N/A
 - j. Articulation Class (AC): N/A
 - k. Flame Spread: ASTM E 1264; Class A.
 - l. Light Reflectance (LR) White Panel: ASTM E 1477; .
 - m. Dimensional Stability:
 - n. Recycle Content: N/A
 - o. Basis-of-Design Product: SERPENTINA Components, 845V No added formaldehyde as manufactured by Armstrong World Industries.
3. Panel Type C: 445H1516PT – 45 degree Arc – 2x4 panels – 4STR Perimeter Trim
- a. Surface Texture: Smooth
 - b. Composition: Metal
 - c. Color: MY – “Gun Metal Grey”
 - d. Size: 24" x 48" – See drawings for panel layout / configuration
 - e. Edge Profile: Square 15/16"
 - f. Perforation Option: R125
 - g. Noise Reduction Coefficient (NRC): N/A
 - h. Ceiling Attenuation Class (CAC): N/A
 - i. Sabin: N/A
 - j. Articulation Class (AC): N/A
 - k. Flame Spread: ASTM E 1264; Class A.
 - l. Light Reflectance (LR) White Panel: ASTM E 1477; .
 - m. Dimensional Stability:
 - n. Recycle Content: N/A

- o. Basis-of-Design Product: SERPENTINA Components, 445H No added formaldehyde as manufactured by Armstrong World Industries.
4. Panel Type D: 445V1516PT – 45 degree Arc – 2x4 panels – 4STR Perimeter Trim
- a. Surface Texture: Smooth
 - b. Composition: Metal
 - c. Color: MY – “Gun Metal Grey”
 - d. Size: 24" x 48" – See drawings for panel layout / configuration
 - e. Edge Profile: Square 15/16"
 - f. Perforation Option: R125
 - g. Noise Reduction Coefficient (NRC): N/A
 - h. Ceiling Attenuation Class (CAC): N/A
 - i. Sabin: N/A
 - j. Articulation Class (AC): N/A
 - k. Flame Spread: ASTM E 1264; Class A.
 - l. Light Reflectance (LR) White Panel: ASTM E 1477; .
 - m. Dimensional Stability:
 - n. Recycle Content: N/A
 - o. Basis-of-Design Product: SERPENTINA Components, 445V No added formaldehyde as manufactured by Armstrong World Industries.
5. Metal Panel Accessories:
- a. SCXT24SPT - Semi-concealed cross tee.
 - b. Use stainless steel / pool compatible accessories with this system. These panels will be installed above an indoor pool.
 - c. 8200T10 infill panel on the backside of all panels.
No acoustical fleece applied to the backside of these perforated Serpentina panels, as this system will be used in a pool environment.
 - d. DLCC - Direct Load Ceiling Clip to be used as necessary (Used to hang suspension system below existing 15/16" grid face, transferring weight directly to hanger wire).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

- B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
 - 1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

- A. Follow manufacturer installation instructions.
- B. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
- C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
- D. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
- E. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.
- F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

- A. Replace damaged and broken panels.
- B. Clean exposed surfaces of ceilings panels, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 50 00

SECTION 09 51 13 - 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. This Section includes acoustical panels with exposed suspension systems for ceilings.

1.3 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension system members.
 - 2. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Minimum Drawing Scale: 1/4 inch = 1 foot.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch- square.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.

- D. Maintenance Data: For finishes to include in maintenance manuals.

1.5 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.

1.6 PROJECT 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.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels 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.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: As designated at the Finish Schedule.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated

that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
- B. 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.
- C. 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.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. Products: Subject to compliance with requirements, provide one of the following manufacture products:
1. Armstrong World Industries.
 2. USG Ceilings
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as noted in "Room Finish Schedule" and "Finish Legend" in the Construction Documents.
- C. Class A: Flame spread 0-25; Smoke developed 0-450.

2.3 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.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
 - 2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- diameter wire.

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING (Refer to Finish Schedule on construction documents).

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Armstrong World Industries.
 - 2. USG Ceilings
- B. Refer to Acoustical Panel for type of grid required.
 - 1. Structural Classification: Intermediate-duty system.
 - 2. Face Design: Flat, flush.
 - 3. Face Finish: As indicated at Finish Schedule.

2.5 METAL EDGE MOLDINGS AND TRIM

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Armstrong World Industries.
 - 2. USG Ceilings
- B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
 - 1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
 - 2. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
 - 3. Conversion-Coated Finish: AA-M12C42 (Chemical Finish: cleaned with inhibited chemicals; acid-chromate-fluoride-phosphate conversion coating).
- C. Armstrong Ceiling Trim (Basis of Design to match)
 - 1. Style: Classic Straight.
 - 2. Size: Varies, Refer to the Construction Drawings

3. Color: As indicated at Finish Schedule.

2.6 ACOUSTICAL SEALANT

- A. Products: Subject to compliance with requirements, provide one of the following:
 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
- B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex 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.

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.
 1. 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 and seismic design requirements indicated, per 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. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 8. 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 post-installed 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 o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. 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. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 3. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

4. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.

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 09 51 13

SECTION 09 65 13 - 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

- B. Related Sections:

- 1. Division 09 Section "Resilient Tile Flooring" for resilient floor tile.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

- 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.5 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 or more than 90 deg F.

1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, 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. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Furnish not less than 10 linear feet for every, or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

- A. Resilient Base:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johnsonite (BOD)
 - b. Roppe Corporation, USA
 - c. FLEXCO
 - d. Burke
- B. Resilient Base Standard: ASTM F 1861
 1. Material Requirement: Type TS (rubber, vulcanized thermoset).
 2. Manufacturing Method: Group I (solid, homogeneous).
 3. Style: Refer to interior finish legend in the Construction Documents.
- C. Minimum Thickness: 0.125 inch
- D. Height: 4 inches and 6" refer to interior finish legend and room finish schedule.
- E. Lengths: Coils (Commercial Roll Goods)
- F. Outside Corners: Preformed
- G. Inside Corners: Preformed
- H. Colors and Patterns: Refer to the Finish Schedule.

2.2 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johnsonite (BOD)
 - b. FLEXCO
 - c. Roppe Corporation, USA

B. Description: Carpet edge for glue-down applications. Nosing for carpet, Nosing for resilient floor covering, Reducer strip for resilient floor covering, Transition strips.

C. Material: Thermoset Rubber.

D. Profile and Dimensions: As indicated on the construction drawings.

E. Colors and Patterns: As designated at the Finish Schedule or as selected by Architect from manufacturer's full line of finishes.

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 manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

C. Floor Polish: Provide protective liquid floor polish products as recommended by resilient stair tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. 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.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

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 unless otherwise noted.
- C. Install resilient base in lengths as long as practicable 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 carpet or resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of 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 surfaces thoroughly.
 - 3. Damp-mop 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. Floor Polish: Remove soil, visible adhesive and surface blemishes from resilient stair treads before applying liquid floor polish.
 - 1. Apply one coat.
- E. Cover resilient products until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 65 16.23 - RESILIENT VINYL SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Documents
Section Includes: This section includes labor, materials and other services necessary to complete resilient safety sheet vinyl flooring systems and accessories work. Conform with requirements of all Sections of Division 1, General Requirements, as it applies to the work of this Section, including but not limited to the following:
 - 1. Coordination of start date and timeframe.
 - 2. Coordination of substrate preparation.
 - 3. Coordination of moisture and pH testing.
 - 4. Coordination with moisture mitigation if required.
 - 5. Coordination of proper plumbing fixtures for connections with flooring.
 - 6. Floor installation and heat welding of all seams, horizontal and vertical.
- C. Related Section
 - 1. Section 014500 – Testing and Inspection Services
 - 2. Section 024100 - Selective Demolition
 - 3. Section 033000 - Cast-in-Place Concrete: Concrete finishing.
 - 4. Section 061000 - Rough Carpentry: Plywood floor sheathing.
 - 5. Section 072600 – Underslab Vapor Retarders
 - 6. Division 15 – Plumbing & HVAC.
 - 7. Section 220000 Plumbing

1.2 REFERENCES

- A. **ASTM D 2047**, Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
- B. **ASTM E 648/NFPA 253**, Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- C. **ASTM E662**, Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- D. **ASTM F710**, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- E. **ASTM F 970**, Standard Test Method for Static Load Limit.

- F. **ASTM F1482**, Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring.
- G. **ASTM F1303**, Standard Specification for Sheet Vinyl Floor Covering with Backing.
- H. **ASTM F2170**, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- I. **ASTM F 3010** Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings
- J. **DIN 51130** Slip Resistance Test
- K. **ACI 302.2R-06** Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials
- L. **RFCI** Recommended Work Practices for Removal of Resilient Floor Covering
- M. **ACI 302.2R-06** Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials
- N. **RFCI** Recommended Work Practices for Removal of Resilient Floor Covering
- O. **ANSI/ICPA SS-1 2001**, Performance standard for Solid Surface Materials
- P. **IAPMO PS 106-2015e1**, Tileable Shower Receptors and Shower Kits
- Q. **2021, 2018, 2015, 2012 and 2009** International Plumbing Code (IPC)
- R. **2021, 2018, 2015, 2012 and 2009** Uniform Plumbing Code (UPC)

1.3 SUBMITTALS

- A. **Product Data:** Submit manufacturer's current printed product literature, specifications, installation instructions, including the Altro Wet Area Detailing Guide, along with field reports in accordance with Section 013300 - Submittal Procedures.
- B. **Shop Drawings:** Submit shop drawings to indicate materials, details, and accessories in accordance with Submittal Procedures including but not limited to the following:
 - 1. Submit a cut diagram indicating seam locations and roll direction. Use mitered seam layouts for corners when changing directions 180 degrees (e.g. when running material down corridors which bisect at a right angle), unless approved otherwise.
 - 2. Floor Plans including notations at each drainage protrusion (drains, cleanouts, grease traps and similar items) as to the method of connection.
 - 3. Wall caps and transition to adjacent materials.
- C. **Samples:** Submit duplicate 8" x 10" (203.2 mm x 254 mm) sample pieces of sheet material, 6" (152 mm) long gully edge, cap strip, cove former in accordance with Section 01330 - Submittal Procedures.

- D. Closeout Submittals -Submit the following:
1. Operation and Maintenance Data: Submit manufacturer's operation and maintenance data for incorporation into manual specified in accordance with Section 01780 - Closeout Submittals. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
1. Training: Installer who has attended an Altro flooring installation training clinic or who has successfully installed Altro in three wet area installations.
 2. Awarded flooring contractor must use in-house installers.
 3. Awarded flooring contractor must be able to provide recent Altro references with contacts.
- B. Mock-ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods, including concrete substrate testing.
1. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
 2. Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.
- C. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, manufacturer's warranty requirements, and installer qualifications.
- D. Bond Test: Install multiple bond tests using 3' x 3' pieces of material adhered with the appropriate adhesive to verify quality of adhesion. Remove half of each piece after 24 hours, then the other half after 48 hours. To help assess resistance to indentation, place end user equipment onto a sample for 72 hours. Document all results.
- E. Regulatory Requirements: Provide safety flooring in compliance with the following:
1. Americans with Disabilities Act Architectural Guidelines (ADAAG)
 2. Occupational Safety and Health Administration (OSHA)

1.5 SITE CONDITIONS

- A. Temperature Requirements: If storage temperature is below 68F (20C) or the floor temperature is below 65F (18C), the Altro flooring must be moved to a warmer place and allowed to reach this temperature before unrolling or installation. For further information, refer to current Altro Installation Practices and Quick Facts.
- B. Maintain air temperature and structural base temperature at flooring installation area between 68F (20C) and 80F (26C) for 72 hours before, during and 24 hours after installation.

- C. Maintain the ambient relative humidity between 40 percent and 60 percent during installation.
- D. Allow sufficient time for proper preparation, installation and curing.
- E. Close spaces to traffic during resilient flooring installation until the installer is satisfied the adhesive has set.
- F. Verify permanent HVAC is operational. If temporary heat is required, use electric or indirect heat sources. **Do not use kerosene or propane in direct contact with the ambient air.**
- G. Verify other finishing operations, including painting, have been completed.
- H. Where demountable partitions and other items are indicated for installation on top of sheet resilient flooring material, install flooring material before these items are to be installed.
- I. Coordinate with plumbing subcontractor that approved surface membrane clamping drainage connections will be used, including but not limited to, surface clamping round drains, surface clamping trench drains, surface clamping floor sinks, surface clamping grease traps, or use of Altro Gulley Edge/Angle, or employment of Altro's Modified Surface Clamping Drain System if existing drains cannot be removed.
- J. Conform to all pertinent ASTM, ACI and Altro Standards listed in, but not limited to, this specification.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Deliver, store and handle resilient flooring materials in accordance with Section 01610 - Basic Material Requirements.
- C. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer.
- E. Store rolls in dry locations. Stand rolls on end. Protect and secure rolls from falling.

1.7 WASTE MANAGEMENT AND DISPOSAL

- A. Deposit all packaging materials in appropriate container on site for recycling or reuse.
- B. Avoid using landfill waste disposal procedures when recycling facilities are available.
- C. Keep all discarded packaging away from children.

1.8 WARRANTY

- A. Warranty period for Altro Classic 25 shall be 12 years commencing on date of substantial completion.
- B. A Labor Warranty period of 2 years to be supplied by Sub-Contractor.

PART 2 - PRODUCTS

2.1 HEAVY DUTY SAFETY FLOORING

- A. Heavy Duty Safety Sheet Vinyl Manufacturer: Altro. (B.O.D.)
 - 1. USA: Altro USA, Incorporated
80 Industrial Way
Wilmington, MA 01887
Toll Free: 800.377.5597
Tel: 978.657.6464
Fax: 610.746.4325
Email: request info (support@altrofloors.com)
Web : www.altrofloors.com
Material: Altro Classic 25; ASTM D2047 .9 Dry, 1.0 Wet; Thickness: 2.5 mm (0.10"); Roll Width: 2 m (6' 7"); Roll Length: 20 m (66'); Roll Weight: 129.5 kg (285 lbs). **Minimum operating temperatures should not drop below - 20°C (-4°F).**

- B. Acceptable material : Altro Classic 25

COLOR

Color to be selected from current range found at www.altrofloors.com

- 1. Reference interior finish drawings for color selection

2.2 ACCESSORIES

- A. **Vinyl welding rod:** Acceptable material:
 - 1. Altro weld rod: color shall match floor finish color selection as indicated on interior finish drawings.
- B. **Cove former:** Acceptable material, sized to suit application:
 - 1. Altro Cove former 20R - 24 mm (1") radius.
- C. **Gulley edge:** Acceptable material, vinyl, sized to suit application:
 - 1. Altro Gulley Edge GA 35/25, GE 35RE, GE 25RE.

- D. **Cap strip:** Acceptable material, sized to suit application, Vinyl:
 - 1. Altro Cap Strip C4.
- E. **Subfloor Filler and Leveler:** Use only gray Portland cement-based “moisture tolerant” underlayments, and patching compounds. Use for filling cracks, holes or leveling. White gypsum materials are not acceptable.
- F. Metal edge strips: Altro visedge.
 - 1. Aluminum extruded, smooth, [mill finish] stainless steel with lip to extend over flooring.
- G. Adhesives
 - 1. Altrofix 30- 2-part polyurethane for areas prone to moisture
 - 2. Altrofix 31- 2-part polyurethane fast set adhesive
 - 3. MP600 – caulking adhesive for use with Altro Gulley Edge
- H. **Caulking:** AltroMastic 100 caulking compound (color match flooring) for use where Altro floors abuts edges, skirtings, wall surfaces or where the flooring is cut around pipes and door frames.
- I. Stainless Steel Corner Guard: 3” height
- J. **Stainless Steel Deflector Plate:** for use under stove equipment not fitted with such; 22”x22”

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Compliance:** Comply with manufacturer’s product data, including product technical bulletins and product catalog for the specified Altro Flooring. Installation instructions found at www.altrofloors.com.
- B. **Site Verification of Conditions:** Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer’s instructions.

3.2 PREPARATION

- A. Remove substrate paint, coatings and other substances that are incompatible with adhesives or contain soap, wax, oil, solvents, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- B. Verify permanent HVAC is operational. If temporary heat is required, use electric or indirect heat sources. **Do not use kerosene or propane in direct contact with the ambient air.**
- C. Verify other finishing operations, including painting, have been completed.

- D. Permanent and non-permanent markers, pens, crayons, and paint shall not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.
- E. Altro Safety flooring shall be installed over subfloors conforming to ASTM F710 for concrete and other monolithic floors or ASTM F1482 for wood subfloors.
- F. Always conduct moisture tests per ASTM F-2170 on all concrete slabs regardless of age or grade level. ASTM F-2170 Internal Relative Humidity (IRH) test results must not exceed 90%. Alkalinity Testing per ASTM F710 with an acceptable range of 7-9.9 pH.
- G. Do not proceed with work until results of moisture condition tests are acceptable.
- H. When patching, a **moisture tolerant** patching compound must always be used.
- I. Contingency for High Moisture Readings in Concrete:
 - 1. If at the time of installation the moisture readings are in excess of Altro's recommendations, the General Contractor shall employ a means of Moisture Mitigation. This includes, but is not limited to, the following methods:
 - a. Application of a Moisture Reduction Barrier (MRB)
 - b. Temporary use of dehumidification equipment.
 - c. Postponing of the flooring installation start time.
 - d. A budget should be provided to the general contractor for use of an MRB
- J. Wood Subfloors: Confirm wood subfloors meet the following requirements.
 - 1. Must conform to ASTM F-1482 Standard Guide to Wood Substrates. Wood subfloors shall have a minimum 18 inch (45.7 cm) of cross-ventilated space beneath the bottom of the joist. The floor must be rigid, free of movement.
 - 2. Single wood and tongue and groove subfloors shall be covered with a minimum 1/4 inch (6.4 mm), 3/8 inch (9mm) or 1/2 inch (12.7 mm) APA approved underlayment plywood as follows.
 - 3. Use 1/4 inch (6.4 mm) thick underlayment panels for boards with a face width of 3 inches (76 mm) or less.
 - 4. Use 1/2 inch (12.7 mm) thick underlayment panels for boards with a face width wider than 3 inches (76 mm).
 - 5. Do not install directly on OSB (Oriented Strand Board), particleboard, chipboard, luan or composite type panels unless specifically designed and approved by the panel manufacturer for use as a resilient flooring underlayment.

3.3 INSTALLATION

- A. Installation: Install Altro flooring in accordance with the current posted Altro Installation Practices at www.altrofloors.com, Technical, Installation Guides. All seams shall be heat-welded with Altro Weldrod™ only. Failure to install Altro Safety flooring in accordance with recommended procedures will void the Altro Limited Product Warranty.

- B. [Wet Area Detailing Guide](#): can be found on our website at www.altrofloors.com, Technical, Installation Guides. The installation of Altro Classic 25 is a system installation. All circular drain covers must be modified in the field or specified by the architect to be Surface-Membrane Clamping Style Drains and installed per the instructions in the Altro Flooring installation guide. The Gully Edge/Angle, AltroMastic 100, Cove Former, and Cap Strip Accessories are necessary accessories for a water-tight and manufacturer-compliant installation.
- C. Drains: Fit Altro Safety flooring and mechanically fasten to drain outlets to ensure a permanent, watertight installation.
1. **New Round Drains:** Install round flash clamping ring type drains to accommodate Altro safety flooring. Install drains to fit flush with surrounding floor surface. **Please refer to Altro’s current Installation Guide for approved drain styles, www.altrofloors.com.** Technical, Installation Guides. If the drain body specified has weep holes that they be sealed so as not to allow moisture from inside the drain itself to leak back up and out of the weep holes. **If Surface-Clamping Style Drains are not utilized, the Flooring Sub-Contractor MUST modify the drain covers to mechanically fasten flooring to drain outlets as per Altro’s guidelines to drain modifications.**
 2. **Existing Drains:** If Surface-Clamping Style Drains are not utilized, provide mechanically fastened stainless steel drain rings over all-round drain outlets as per Altro’s guidelines to drain modifications. Fit rings over slip resistant sheet vinyl and permit inside diameter that will allow clean-out plate to be removed after installation. Drill into concrete to accommodate lead or plastic anchors. Screw drain rings to create a tight seal with beveled head stainless steel screws.
 3. **Square and Rectangular Drains and Floor Sinks:** Heat-weld Altro Gully Edge GE25RE or GE35RE (color match) around perimeter of drain which has been set in concrete in accordance with Altro Installation Guide. **Do not use Altro Gully Edge around drains set in wood floors.** Provide stainless steel strips, mechanically fastened with stainless steel screws. Use stainless steel strips in other areas where it is not practical to use Altro Gully Edge.
- D. Coved Installation: Altro flooring should be coved up wall surfaces and other abutments, installation shall be in accordance with Altro Installation Practices using the following accessories:
1. At standard wall finishes: Use Altro C7 vinyl cap strip to accommodate sheet vinyl to a height as indicated; adhere with contact tape.
 2. At ceramic tile, Altro Puraguard wall cladding or FRP paneling: Use Vinyl Cap Altro C8 or C4, or Altro Stainless Steel Cap.
 3. When coving up the wall; at juncture of vertical and horizontal surfaces: Use Altro Vinyl Cove Former and install with contact tape.
 4. Top set cove base: Install in accordance with manufacturer’s instructions.

3.4 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Never use tapes on the surface on the finish flooring. Never use Sharpies, pens, crayons or construction markers on either the finish flooring or the substrate.

- B. Repair or replace damaged installed products.
- C. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.
- D. Current recommended maintenance procedures can be found on the Altro website at www.altrofloors.com, Technical Documents, Maintenance Guides.
- E. Sweep or vacuum all construction debris and dust first, then clean the flooring with AltroClean 44 /AltroClean 44 Plus using an auto scrubber.
- F. Cover and protect finished installation from damage from other trades using a non-staining, temporary floor protection system, such as reusable textured plastic sheeting.
- G. No traffic for 24 hours after installation, unless approved by Altro technical.
- H. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.
- I. Wait 72 hours after installation before performing initial cleaning. Start a regular maintenance program after the initial cleaning as recommended by manufacturer.

3.5 PROTECTION

- A. Cover and protect finished installation from damage from other trades using a non-staining, temporary floor protection system, such as a reusable textured plastic sheeting.
- B. Altro Classic 25 should be covered and protected from all other trades during construction with a suitable non-staining protective covering **without taping to the surface of flooring**.

END OF SECTION 09 65 16.23

SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. As designated in Room Finish Schedule

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Samples: Full-size units of each color and pattern of floor tile required.
- D. Samples for Initial Selection: For each type of floor tile indicated.
- E. Samples for Verification: Full-size units of each color and pattern of floor tile required.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: As designated in the Finish Schedule.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.
 - 2. Installer for Resilient product F-6 should be Nora® approved for the requirements of the project or INSTALL (International Standards & Training Alliance) resilient certified for the requirements of the project.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg. F or more than 90 deg. F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

- A. An installation area that is weather tight and maintains ambient temperatures within range recommended by manufacturer, but not less than 70 deg. F or more than 95 deg. F, in spaces to receive floor tile and a secure storage area that is maintained permanently or temporarily at 50% ± 10% relative humidity during the following time periods :
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 72 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 for more than 95 deg. F.
- C. Close spaces to traffic during floor tile installation. Prevent all traffic for a minimum of 12 hours and rolling loads for 72 hours to allow the adhesive to cure. If required, after 12 hours protect the flooring from damage during construction operations using Masonite, plywood or a similar product, ensuring first that the flooring surface is free of all debris. Lay panels so that the edges form a butt joint and tape the joint to prevent both movement and debris entrapment underneath them. Inspect immediately before covering and after removal for final acceptance.
- D. Install floor tile after other finishing operations, including painting, have been completed.
- E. A concrete subfloor that meets the requirements of ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring is required, or as detailed in the Nora® Installation Guide.
- F. Areas of the flooring that are subject to direct sunlight through doors or windows should have them covered using blinds, curtains, cardboard or similar for the time of the installation and 72

hours after the installation to allow the adhesive to cure. Note: These areas should be installed using wet adhesives only.

- G. Clean out and fill or repair any dormant saw cuts and cracks with an appropriate product following the manufacturers written usage instructions. For any expansion (moving) joints, use an industry standard expansion joint assembly.
- H. When required, use a leveler following the manufacturers written instructions. The surface should be free of dust, solvents, paint, wax, varnish, oil, grease, asphalt, old adhesives, and other extraneous materials that may interfere with the bond. These should be completely removed by mechanical means only. Dustless diamond grinding or bead blasting are the preferred method to remove contaminates and bond breakers, as it also helps to level the concrete.
- I. Prime the subfloor prior to using a suitable leveler. Note: a 1/8 inch minimum thickness is required for the leveler to be considered porous as required when using Nora® 485 or 685 acrylic adhesives.
- J. Vacuum floors immediately prior to installing the flooring to remove all loose particles. If required, only use water based sweeping compounds. Do not use any wax or oil based compounds that leave behind a residue that may interfere with the adhesive bond.
- K. When required, install resilient stair-treads and accessories in accordance with the Nora® Installation Guide.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. FloorScore Compliance: Resilient tile flooring shall comply with requirements of FloorScore certification.
- C. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Apply vapor emission treatment to all slab-on-grade concrete surfaces receiving floor tile. Koester VAP1 2000 system. Follow manufacturer instructions of applying Koester VP 1 2000 system. Floor tiles adhesives must be compatible with VAP 1 2000.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

- b. Clean out and fill or repair any dormant saw cuts and cracks with an appropriate product following the manufacturers written usage instructions. For any expansion (moving) joints, use an industry standard expansion joint assembly.
 - c. When required, use a leveler following the manufacturers written instructions. The surface should be free of dust, solvents, paint, wax, varnish, oil, grease, asphalt, old adhesives, and other extraneous materials that may interfere with the bond. These should be completely removed by mechanical means only. Dustless diamond grinding or bead blasting are the preferred method to remove contaminates and bond breakers, as it also helps to level the concrete.
 - d. Prime the subfloor prior to using a suitable leveler. Note: a 1/8 inch minimum thickness is required for the leveler to be considered porous as required when using Nora® 485 or 685 acrylic adhesives.
 - e. Vacuum floors immediately prior to installing the flooring to remove all loose particles. If required, only use water based sweeping compounds. Do not use any wax or oil based compounds that leave behind a residue that may interfere with the adhesive bond.
- 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. Patching compounds shall only be utilized only as approved and recommended by individual product manufacturer’s written installation instructions.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
- 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. When required, use a leveler following the manufacturers written instructions. The surface should be free of dust, solvents, paint, wax, varnish, oil, grease, asphalt, old adhesives, and other extraneous materials that may interfere with the bond. These should be completely removed by mechanical means only. Dustless diamond grinding or bead blasting are the preferred method to remove contaminates and bond breakers, as it also helps to level the concrete.
- F. Prime the subfloor prior to using a suitable leveler. Note: a 1/8 inch minimum thickness is required for the leveler to be considered porous as required, when using Nora® 485 or 685 acrylic adhesives.
- G. Vacuum floors immediately prior to installing the flooring to remove all loose particles. If required, only use water based sweeping compounds. Do not use any wax or oil based compounds that leave behind a residue that may interfere with the adhesive bond.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles in pattern indicated on drawings.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles in pattern of colors and sizes indicated on drawings.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of 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 surfaces thoroughly.
 - 3. Damp-mop 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. No traffic for 24 hours after installation.
- E. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.
- F. Wait 72 hours after installation before performing initial cleaning.
- G. A regular maintenance program must be started after the initial cleaning.

END OF SECTION 09 65 19

SECTION 09 66 23 - RESINOUS TERRAZZO FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Poured in place resinous matrix epoxy terrazzo flooring.
2. 4" high pre-cast terrazzo wall base units with covered base and finished top. The covered toe shall be flush to the finished floor. Set-on base is not acceptable.
3. Locate all flexible joints required. See submittals below.
4. Accessories necessary for complete installation.
5. Backing for Epoxy Terrazzo base must be a cement board or exterior grade plywood, concrete block, concrete or cement plaster.
6. Sufficient water, temporary heat and light and adequate electric power with suitable outlets connected and distributed for use within 100 feet of any working space.
Note: Ambient temperature shall be maintained as per manufacturer recommendations, minimum 60 degrees Fahrenheit.

- B. Related Sections:

1. Cast-in-Place Concrete: Section 03 30 00.
 - a. Concrete sub-floor to be level (maximum variation not to exceed 1/4 inch in 10 feet) and to have a steel trowel finished surface. No curing agents or other additives which could prevent bonding should be used.
 - b. The slab should have an efficient moisture barrier placed directly under the concrete slab when placed directly on grade. Saw cutting of control joints must be done between 12-24 hours after placement of the structural concrete.
2. Sealants: Section 07 92 00.
3. Gypsum Drywall: Section 09 25 00.
4. Adjacent floor finishes: Division 9.
5. Shotblast or rough grind area to receive Terrazzo according to manufacturer's recommendations.

1.3 QUALITY ASSURANCE

A. Acceptable Suppliers:

1. Suppliers shall provide materials in accordance with NTMA standards.
2. Materials used in the floor surfacing shall be the products of a single manufacturer.
3. Precast treads and riser units shall be calculated to span the length of the distance as indicated in stair details drawing. Calculation to be done by a Professional Engineer and shop drawing to be stamped.

B. Acceptable Installers:

1. Acceptable installer shall be a contractor member of the NTMA and perform all work in accordance with NTMA standards.
2. If installer is not a contractor member of the NTMA, he shall submit a list of 5 completed projects of similar magnitude and complexity.
3. Installer must be acceptable to Key Resin Company.
4. Installation shall be performed by an applicator with minimum 3 years experience in work of similar nature and scope. Installer must be approved by the manufacturer of the floor surfacing materials. The contractor shall furnish a written statement from the manufacturer that the installer is acceptable.
5. Installer to verify locations of all flexible joints required by the provisions of this Section and by the recommendations of the related material manufacturers.
 - a. Joint locations may or may not be shown in drawings.
 - b. Refer to drawings required under SUBMITTALS above.
6. Contractor to have proven experience with specified system.
7. Mock-up: Prior to starting application of flooring, provide full scale portable mock-up to establish acceptable quality, durability, and appearance. Mock-up size must not be less than 4 square feet. An “in-place” mock-up may be acceptable provided that it can be coordinated with the work in progress and can be fully protected for the duration of work on-going.
 - a. Acceptable mock-up to be standard of quality for installed work.
 - b. Unacceptable installed work to be removed and replaced or refinished until acceptable.

1.4 SUBMITTALS

A. Samples:

1. Submit maximum of three samples, 6 inches by 6 inches for each color and type of terrazzo as specified.
2. Submit two 6-inch lengths of each type and kind of divider strips as specified.
3. Manufacturers Application Instructions: Submit descriptive data and specific recommendations for mixing, application, curing including any precautions of special handling instructions required to comply with the Occupational Safety and Health Act.
4. Shop Drawings: Shop Drawings shall be furnished showing installation of cove base and termination details and details at floor material transitions and where adjoining equipment.
 - a. Locate and provide detailing for flexible joints required for flooring in area of installation.

B. Maintenance Literature:

1. Submit two copies of NTMA and/or manufacturer's maintenance recommendations.

C. Certification:

1. Suppliers shall furnish certification attesting that materials meet specification requirements.
2. Suppliers shall furnish properly labeled material and Material Safety Data Sheets which comply to current state and federal requirements.
3. Suppliers shall submit certification that installer is an approved applicator of material selected.

1.5 DELIVERY, STORAGE AND HANDLING

- A. All materials shall be delivered to project site in original manufacturer's sealed containers including type of material, batch numbers, date of manufacture, and pertinent labels intact and legible.
- B. Store materials in dry protected area at a temperature between 60° F to 80° F.
- C. Follow all manufacturer's specific instructions and prudent safety practices for storage and handling.

1.6 GUARANTEE

- A. One year from date of completion of terrazzo installation.

1.7 PROJECT CONDITIONS

- A. Maintain the ambient room and floor temperature at 60 degrees Fahrenheit, or above for a period extending from 72 hours before, during and after floor installation. Concrete to receive surfacing shall have cured for at least 28 days and be free of all curing compounds.

- B. Pre-job meeting between General Contractor, Architect, and installer shall be held to discuss concrete substrate, location of joints and/or saw cuts to minimize subfloor cracking and locations of control joints and strips in terrazzo surface.
- C. Acceptable Substrates
 - 1. Level tolerance: Concrete subfloor shall be level with a maximum variation from level of 1/4" in 10 feet. Any irregularity of the surface requiring patching and/or leveling shall be done using material approved by the manufacturer.
 - 2. Concrete floor shall receive a light steel trowel finish.
 - 3. Concrete shall be cured a minimum of 28 days. No curing agents are to be used in areas to receive terrazzo.
 - 4. Concrete slab shall have an efficient puncture-resistant, reinforced moisture vapor barrier 10 mils thick minimum placed directly under the concrete slab (for slab on grade). Do not use vapor barrier manufactured with recycled material.
 - 5. Testing must be done to verify that the moisture vapor emission rate of the slab does not exceed that as recommended by the manufacturer at time of installation of the flooring or at any future date. Moisture vapor emission and moisture content testing must conform with the requirements of ASTM F-1869 (Calcium Chloride Test) and ASTM F-2170 (Relative Humidity Probe Test). Install manufacturer's recommended moisture vapor emission control material based upon the highest test reading.
 - 6. Vapor emissions control product shall be required beneath the terrazzo floor in its entirety and shall be provided and installed by the Terrazzo installer. The vapor emissions control product shall be in conformance with the Terrazzo manufacturer's requirements for compatibility with their flooring system and shall limit vapor emissions as required to meet their system requirements and warranty. Vapor emissions testing shall be performed to inform the level of emissions present at the time of installation, however, in no case shall the vapor emissions product perform to a level less than is required for the installation of the Manufacturer's terrazzo system.
 - 7. Saw cutting of control joints must be done between 12 and 24 hours after placement of the structural concrete.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide conforming products based on:

1. Key Resin Company: 3/8" Nominal thickness Basis of Design Epoxy Terrazzo.
2. Classified Products, Inc.
3. TEC Brands, Inc. Specialty Construction

2.2 MATERIALS

- A. Primer: Only as recommended by the manufacturer.
- B. Epoxy resin binder mixed according to manufacturer's recommendation and tested without aggregate added. All specimens cured for 7 days at 75 degrees plus or minus 2 degrees Fahrenheit and 50% plus or minus 2% R.H. The product shall meet the following requirements:

Property	Test Method	Requirement
Hardness	ASTM D-2240 using Shore D Durometer	60-85
Tensile Strength	ASTM D-412 Specimen made using "C" die	3,000 psi Minimum
Compressive Strength	ASTM D-695 Specimen "B" cylinder	10,000 psi Minimum
Chemical Resistance	ASTM D-1308 seven days at room temperature by immersion method	No deleterious effects: Distilled Water Mineral Oil Isopropanol Ethanol 0.025 Detergent Solution 1% Soap Solution 10% Sodium Hydroxide 10% Hydrochloric Acid 30% Sulfuric Acid

- C. Epoxy Resin mixed according to manufacturers recommendations and blended with 3 volumes of Georgia White marble blended 60% #1 chip and 40% #0 chip, ground and grouted with epoxy resin according to 3.02 C-2. All specimens cured 7 days at 75 degrees plus or minus 2 degrees Fahrenheit and 50% plus or minus R.H. The finished epoxy terrazzo shall meet the following requirements:

Property	Test Method	Requirement
Flammability	ASTM D-635	Self-extinguishing, extent of burning .025 inches maximum.

Thermal Coefficient of Linear Expansion	ASTM-D-696	25 x 10 ⁻⁶ inches per inch per degree to 140 degrees Fahrenheit
Bond Strength	ACI Committee No. 403/503 Bulletin Title No.59-43 (Pages 1139-1141)	100% concrete failure minimum, with 300 PSI minimum tensile strength.

Note: This test is intended to evaluate the bond to the concrete subfloor and is to be tested at the discretion of the architect. A 100% concrete failure indicates a good bond.

D. Marble Chips or Glass Aggregate:

1. Size: See mixes 2.3
2. Hardness according to ASTM C-241 Ha-10 minimum.
3. 24 hours absorption rate not to exceed 0.75 percent.
4. Chips shall contain no deleterious or foreign matter.
5. Dust content less than 1% by weight.

E. Strips: See Drawing for pattern of layout

1. Stop and divider "L" strips: 16gauge aluminum
2. Where the radiant heat flooring is used under the terrazzo, install a back to back L strip and then fill the 1/8" gap with flexible sealant Key 780 joint filler. Use this type of joint every 10-15 feet oc.

F. Terrazzo Cleaner:

1. pH factor between 7 and 10 where applicable.
2. Biodegradable and phosphate free.

G. Sealer:

1. pH factor between 7 and 10, where applicable.
2. Shall not discolor or amber.
3. Flash Point: ASTM D-56, 80 degrees Fahrenheit minimum, where applicable.

2.3 MIXES

A. Proportions and Mixing:

1. Epoxy Terrazzo Topping: In accordance with resin supplier's recommendations.

White: Base upon KRC-501 modified to include 50% - 70% recycled glass.

- Black: Based upon KRS-107 modified to include 50% - 70% recycled glass, including a small amount of mirror.
- Red: Matrix color to match Sherwin Williams SW/6608 "Rave Red". Aggregate shall be 50% to 70% recycled glass, small percentage of Walnut Shell, remainder Dark Marble chips (dark brown or black)
- Blue: Matrix color to match Sherwin Williams SW/6531 "Indigo". Aggregate shall be 50% to 70% recycled glass, remainder Dark Marble chips similar to those in KRC-504
- Gray: Matrix color to match

Please note; whenever possible use some percentage of recycled colored glass that matches the matrix color

2. Terrazzo Topping: Charge and mix marble chips and epoxy resin in accordance with supplier's instructions.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive terrazzo for:

1. Defects in existing work that affect proper execution of terrazzo work.

Note: Cracks in substrate will usually be transmitted through topping to surface. Flexible membrane over cracks shall be used to minimize chance of subfloor cracks transferring to the terrazzo surface.

B. Proceed with installation only when all defects have been corrected.

3.2 INSTALLATION

A. Subfloor:

1. Prepare substrate to receive epoxy terrazzo in accordance with manufacturer's recommendations.
2. Substrate Crack Repair: Hairline cracks less than 1/16" width may be filled with neat epoxy resin, Key #502 or Key #730. Treat cracks larger than 1/16" width as recommended in NTMA Technical Bulletin #111 "Crack Detailing and Joint Treatments for Thin Set Terrazzo", Detail #6. Route out all cracks larger than 1/16" width and fill with rigid epoxy. Apply Key #580 Flexible Epoxy across the crack a minimum width of 24 inches at a spread rate of 40-50 square feet per gallon to achieve 32-40 mils dry film thickness over the crack and allow to cure. Optional reinforcement: Apply Key #502 Primer to cured membrane. Imbed fiberglass scrim cloth into wet primer and saturate with additional Key #502 Primer. Alternatively, scrim cloth may be gently placed onto

surface of tacky Key #580 without pressing down into resin. Allow to cure. Saturate cloth during priming step as outlined in section 3.02.B.1.

3. Install divider strips over all concrete joints as recommended in NTMA Technical Bulletin #111 “Crack Detailing and Joint Treatments for Thin Set Terrazzo”, Details #1-#7. Divider strips must be bonded to joint edges for contraction joints (aka control joints/sawcuts) and isolation joints (aka expansion joints) in subfloor. For contraction joints, refer to Details #1-#3. For Isolation joints, refer to Detail #4. For Construction joints (aka cold joints), refer to Detail #7. For exposed contraction joints, fill with Key #780 Epoxy Joint Filler. Fill isolation joints with urethane sealant formulated for use in floor expansion joints supplied by others. Do not use prefabricated double divider strips filled with neoprene.
4. Install divider strips as shown on drawings.

B. Placing Terrazzo:

1. Prime subfloor in accordance with resin supplier's instructions. Install moisture vapor control material before other terrazzo system materials.
2. Place terrazzo mixture and trowel to a dense flat surface to top of divider strips.

C. Finishing:

1. Rough Grinding:
 - a. Grind with 24 or finer grit stones or with comparable diamond plates.
 - b. Follow initial grind with 80 or finer grit stones or with comparable diamond plates.
2. Grouting:
 - a. Cleanse floor with clean water and rinse.
 - b. Remove excess rinse water, dry, and apply epoxy grout, supplied by epoxy manufacturer, to fill voids.
3. Cure Grout.
4. Fine Grinding:
 - a. Grind with 80 or finer grit stones or with comparable diamond plates until all grout is removed from surface. Certain matrix colors and aggregates may require grinding to a level higher than 120 grit for acceptable appearance.
 - b. Upon completion, terrazzo shall reasonably match approved samples with overall uniform chip density.

D. Cleaning and Sealing:

1. Wash all surfaces with a neutral cleaner.
2. Rinse with clean water and allow surface to dry.

3. Apply sealer in accordance with manufacturer's directions. For ADA slip resistance requirement, use UL approved sealer supplied by others as necessary.

(Note: Delete sealer step if substituting alternative maintenance finish system that requires installation over unsealed epoxy terrazzo)

E. Protection:

1. Upon completion, the work shall be ready for final inspection and acceptance by the owner or his agent.
2. The General Contractor shall protect the finished floor from the time that the terrazzo contractor completes the work.

END OF SECTION 09 66 23

SECTION 09 67 23 – RESINOUS FLOORING POLY-CRETE SLB AND POLY-CRETE TF PLUS TOPCOAT (Flintshot)

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. Resinous flooring system as shown on the drawings and in schedules.
- B. Related sections include the following:
 - 1. Cast-in-Place Concrete, section 03 30 00
 - 2. Concrete Curing, section 03 39 00

1.3 SYSTEM DESCRIPTION

- A. The work shall consist of preparation of the substrate, the furnishing and application of a cementitious urethane based self-leveling seamless flooring system with Flintshot quartz aggregate broadcast and polyurethane topcoat.
- B. The system shall have the color and texture as specified by the Owner with a nominal thickness of 3/16 inch. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.
- C. Cove base (if required) to be applied where noted on plans and per manufacturers standard details unless otherwise noted

1.4 SUBMITTALS

- A. Product Data: Latest edition of Manufacturer's literature including performance data and installation procedures.
- B. Manufacturer's Safety Data Sheet (SDS) for each product being used.
- C. Samples: A 3 x 3 inch square sample of the proposed system. Color, texture, and thickness shall be representative of overall appearance of finished system subject to normal tolerances.

1.5 QUALITY ASSURANCE

- A. The Manufacturer shall have a minimum of 10 years experience in the production, sales, and technical support of epoxy and urethane industrial flooring and related materials.

- B. The Applicator shall have experience in installation of the flooring system as confirmed by the manufacturer in all phases of surface preparation and application of the product specified.
- C. No requests for substitutions shall be considered that would change the generic type of the specified System.
- D. System shall be in compliance with requirements of United States Department of Agriculture (USDA), Food, Drug Administration (FDA), and local Health Department.
- E. System shall be in compliance with the Indoor Air Quality requirements of California section 01 35 00 as verified by a qualified independent testing laboratory.
- F. A pre-installation conference shall be held between Applicator, General Contractor and the Owner for review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping

- 1. All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.

B. Storage and Protection

- 1. The Applicator shall be provided with a dry storage area for all components. The area shall be between 60 F and 85 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
- 2. Copies of Safety Data Sheets (SDS) for all components shall be kept on site for review by the Engineer or other personnel.

C. Waste Disposal

- 1. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

1.7 PROJECT CONDITIONS

A. Site Requirements

- 1. Application may proceed while air, material and substrate temperatures are between 60 F and 85 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
- 2. The relative humidity in the specific location of the application shall be less than 85 % and the surface temperature shall be at least 5 F above the dew point.

3. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.
- B. Conditions of new concrete to be coated with cementitious urethane material.
1. Concrete shall be moisture cured for a minimum of 7 days and have fully cured for 14 days in accordance with ACI-308 prior to the application of the coating system pending moisture tests. Outside of these parameters manufacturer shall be consulted.
 2. Concrete shall have a flat rubbed finish, float or light steel trowel finish (a hard steel trowel finish is neither necessary nor desirable).
 3. Sealers and curing agents should not to be used.
 4. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delamination of the system.
- C. Safety Requirements
1. The Owner shall be responsible for the removal of foodstuffs from the work area.
 2. Non-related personnel in the work area shall be kept to a minimum.

1.8 WARRANTY

- A. Dur-A-Flex, Inc. warrants that material shipped to buyers at the time of shipment substantially free from material defects and will perform substantially to Dur-A-Flex, Inc. published literature if used in accordance with the latest prescribed procedures and prior to the expiration date.
- B. Dur-A-Flex, Inc. liability with respect to this warranty is strictly limited to the value of the material purchase.

PART 2 – PRODUCTS

2.1 FLOORING

- A. Dur-A-Flex, Inc, Poly-Crete SLB (self-leveling broadcast quartz), Urethane topcoat seamless flooring system. (Basis of Design or Approved equal.)
 1. System Materials:
 - a. Topping: Dur-A-Flex, Inc, Poly-Crete SL resin, hardener and SL aggregate.
 - b. The aggregate shall be Dur-A-Flex, Inc. Flintshot quartz aggregate.
 - c. Topcoat: Dur-A-Flex, Inc. Poly-Crete TF PLUS resin, hardener and powder.
 2. Patch Materials
 - a. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Poly-Crete MD (up to 1/4 inch).
 - b. Deep Fill and Sloping Material (over 1/4 inch): Use Dur-A-Flex, Inc. Dur-A-Tex UM

2.2 MANUFACTURER

- A. Dur-A-Flex, Inc., 95 Goodwin Street, East Hartford, CT 06108, Phone: (860) 528-9838, Fax: (860) 528-2802
- B. Manufacturer of Approved System shall be single source and made in the USA.

2.3 PRODUCT REQUIREMENTS

- | | |
|--|---|
| <ul style="list-style-type: none"> A. Topping <ul style="list-style-type: none"> 1. Percent Reactive 2. VOC 3. Bond Strength to Concrete ASTM D 4541 4. Compressive Strength, ASTM C 579 5. Tensile Strength, ASTM D 638 6. Flexural Strength, ASTM D 790 7. Impact Resistance @ 125 mils, MIL D-3134,
No visible damage or deterioration B. Topcoat <ul style="list-style-type: none"> 1. Percent Solids 2. VOC 3. Compressive Strength ASTM C 579 4. Tensile Strength, ASTM D 638 5. Flexural Strength ASTM D 790 6. Abrasion Resistance, ASTM C 501
PDS-Taber CS17, 1,000 gm load, 1,000 cycles 7. Hardness, Shore D 8. Potlife @ 77 F | <p>Poly-Crete SL</p> <p>100 %</p> <p>0 g/L</p> <p>>400 psi, substrates fails</p> <p>9,000 psi</p> <p>2,175 psi</p> <p>5,076 psi</p> <p>Pass</p>
<p>Poly-Crete TF PLUS</p> <p>100 %</p> <p>0 g/L</p> <p>7,250 psi</p> <p>750 psi</p> <p>4,400 psi</p> <p>40 mg weight loss</p> <p>85</p> <p>15 minutes</p> |
|--|---|

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.
 - 2. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

3.2 PREPARATION

- A. General
 - 1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
 - 2. Moisture Testing: Perform tests recommended by manufacturer and as follows.

- a. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 99% relative humidity level measurement.
 - b. If the relative humidity exceeds 99% then the Owner and/or Engineer shall be notified and advised of additional cost for the possible installation of a vapor mitigation system that has been approved by the manufacturer or other means to lower the value to the acceptable limit.
3. Mechanical surface preparation
- a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 4-6 as described by the International Concrete Repair Institute.
 - b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
 - c. Wherever a free edge will occur, including doorways, wall perimeters, expansion joints, columns, doorways, drains and equipment pads, a ¼ inch deep by 1/4 inch wide keyways shall be cut in.
 - d. Cracks and joints (non-moving) greater than 1/4 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.
4. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufacturer's recommendations.

3.3 APPLICATION

A. General

1. The system shall be applied in three distinct steps as listed below:
 - a. Substrate preparation
 - b. Topping/overlay application with quartz aggregate broadcast.
 - c. Topcoat application
2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Topping

1. The topping shall be applied as a self-leveling system as specified by the Architect. The topping shall be applied in one lift with a nominal thickness of 1/8 inch.
2. The topping shall be comprised of three components, a resin, hardener and filler as supplied by the Manufacturer.
3. The hardener shall be added to the resin and thoroughly dispersed by suitably approved mechanical means. SL Aggregate shall then be added to the catalyzed mixture and mixed in a manner to achieve a homogenous blend.
4. The topping shall be applied over horizontal surfaces using ½ inch “v” notched squeegee, trowels or other systems approved by the Manufacturer.
5. Immediately upon placing, the topping shall be degassed with a loop roller.
6. Quartz aggregate shall be broadcast to excess into the wet material at the rate of 1 lbs/sf.
7. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate

C. Topcoat

1. The topcoat shall be applied with a coverage rate of 45 sf/kit.
2. The topcoat shall be comprised of a liquid resin, liquid hardener and powder kit and installed per the manufacturer’s recommendations.
3. The finish floor will have a nominal thickness of 3/16 inch.

3.4 FIELD QUALITY CONTROL

A. Tests, Inspection

1. The following tests shall be conducted by the Applicator:
 - a. Temperature
 1. Air, substrate temperatures and, if applicable, dew point.
 - b. Coverage Rates
 1. Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.5 CLEANING AND PROTECTION

- A. Cure flooring material in compliance with manufacturer’s directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
- B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION 09 67 23

SECTION 09 68 13 - 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. This Section includes modular, tufted carpet tile.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.
- B. Shop Drawings: Must 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 as it relates to the Floor Plan.
 - 6. Pattern type, location, and direction.
 - 7. Type, color, and location of edge, transition, and other accessory strips.
 - 8. Transition details to other flooring materials.
- C. 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.
- D. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet tiles until 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.
- 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.

1.7 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which 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 loss of face fiber, edge raveling, snags, runs, dimensional stability and delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, 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.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Products: Subject to compliance with requirements, provide the following:
 - 1. Refer to "Room Finish Schedule" and "Finish Legend" in the Contract Documents.
 - 2. Critical Radiant Fluk – Class 1 (ASTM E-648).

2.2 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 VOC content shall be 0g/L.
- C. Apply Koester VAP 1 2000 System to all slab on grade concrete surfaces receiving floor carpet tile. Follow manufacturer instructions of applying Koester VAP 1 2000. Floor tiles adhesives must be compatible with Koester VAP 1 2000.

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 Division 03 Section "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 wide or wider and protrusions more than 1/32 inch, 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. Adhesives must be compatible with Koester VAP 1 2000 System.
- D. 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, "Protection of 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 09 68 13

SECTION 09 69 90 - WATER VAPOR EMISSION CONTROL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, documents, and general provisions of the Contract, including, but not necessarily limited to, General Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections-Coordinate work if this Section with work of other Sections to properly execute the work requirements and maintain satisfactory progress of work in other Sections.
 - 1. Section 03 30 00: Cast-In Place Concrete Installation and curing requirements according to ACI 302.
 - 2. Section 09 65 19: Resilient Flooring, resinous flooring vinyl tile installation requirements.
 - 3. Section 09 68 13: Tile Carpeting, Installation requirements.

1.2 SUMMARY

- A. This Section includes furnishing, testing, and application of systems for the reduction of moisture vapor transmission and alkalinity control for interior concrete slabs on grade requiring the installation of VCT, vinyl flooring, resinous flooring, carpet, and/or resinous flooring systems.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the, Requirements and Conditions of the Contract, in Division 1. Specification Sections.
- B. Product data for each type of product and process specified, which shall include:
 - 1. Manufacturer's Specification
 - 2. Installation Instructions
 - 3. Independent Test Data
 - 4. Certification Requirements
 - 5. Warranty Information
- C. Submit anhydrous calcium chloride testing according to ASTM F 1869-98 that shall be performed by the Contractor to the Architect, Owner and Water Vapor Reduction System Manufacture's Representative.

1.4 QUALITY ASSURANCE

- A. Qualification of Applicator

1. Employ an Applicator currently approved by the manufacturer, experienced in surface preparation and application of the material and subject to inspection and control of the manufacturer.
2. Installer shall have no less than five (5) years' experience installing fluid-based coating systems.

B. Manufacturer's Qualifications

1. Manufacturer shall have no less than five (5) years' experience in manufacturing water vapor reduction systems. The water vapor reduction system must be specifically formulated and marketed for water vapor reduction and alkalinity control without change of system design for a minimum period of five (2) years.
2. Manufacturer shall provide the Owner with their standard ten (10) year warranty at no additional cost. Applicator of water vapor reduction system shall provide standard installation warranty for workmanship.
3. Manufacturer must provide independent lab test reports documenting performance per the following:
 - a. ASTM E 96, Water Vapor Transmission (wet methods) Performance shall be documented by an independent testing laboratory at a minimum of 90% for Koster VAP I 2000 System, water vapor transmission reduction compared to untreated concrete.
 - b. ASTM D 1308; Insensitivity to alkaline environment up to pH 14.
 - c. Certify acceptance and exposure to continuous topical water exposure after final cure.
4. Submit list of product use and performance history, for the same formulation and system design, listing reference sources. Similar projects shall have documented minimum initial water vapor transmission rates of 15lbs per 1,000 ft² per 24 hours to 3lbs per 1,000 ft² per 24 and have resulted in maintained water vapor reduction rate less than 3lbs per 1,000 ft² per 24 hours when tested according to ASTM 1869.98.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the job site in their original unopened containers, clearing labeled with the manufacturer's name and brand designation.
- B. Store products in an approved ventilated dry area; protect from dampness, freezing, and direct sun light. Product should not be stored in areas with temperatures in excess of 90° F or below 50° F.
- C. Handle product in a manner that will prevent breakage of containers and damage products.

1.6 PROJECT/SITE CONDITIONS

A. Environmental Conditions

1. Do not apply moisture vapor reduction system to unprotected surfaces or when water is accumulated on the surface of the concrete.
2. Do not apply water vapor reduction system when the temperature is lower than 50° F or expected to fall below this temperature within 24 hours from time of application.
3. Allow continuous ventilation and indirect air movement at all times during application and curing process of the water vapor reduction system.

- B. Protection: Protect water vapor reduction system to prevent damage from active rain or topical water for a minimum of 24 hours from time of application.

1.7 SCHEDULING

- A. Before installation of VCT, tile carpet and resilient flooring systems over the interior concrete slabs, anhydrous calcium chloride testing shall be performed as per ASTM F 1869-98 by the Contractor as outlined in Article 3.1 below to determine the level of water vapor transmission in the slab and the type of moisture vapor reduction system required.

- B. The Contractor will coordinate with the Architect scheduling water vapor reduction system testing and allowing enough time to test, submit and install the water vapor reduction system before installation of floor finish.

- C. The Contractor will allow for as much time as is reasonable for the concrete slab to dry before installing anhydrous calcium chloride tests. All mastics, glues, and/or contaminants shall be removed to provide a clean, sound, concrete substrate prior to installing anhydrous calcium chloride tests as per ASTM F 1869-98. No Exceptions!

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Water vapor reduction system, which may be incorporated in the work, shall be the product of a single manufacturer, no substitutions. Manufacturer's offering approved products such as:

1. Koster VAP I 2000 System by Koster American Corporation; Corporate Headquarters: (757) 425-1206. Western Regional Office: (541) 548-0210.

- B. Terminology hereafter is based upon the products of Koster American Corporation.

2.2 MATERIALS

- A. General: Use materials of one manufacturer throughout the project as hereinafter specified.

- B. 100% solids VAP I 2000 coating, containing specifically formulated chemicals and resins to provide the following characteristics and properties.
 - 1. ASTM E 96, Water Vapor Transmission (wet methods) Performance shall be documented by an independent testing laboratory at a minimum 90% for Koster VAP I 2000 System water vapor transmission reduction compared to untreated concrete.
 - 2. ASTM D 1308; Insensitivity to alkaline environment up to pH 14.
 - 3. Certify acceptance and exposure to continuous topical water exposure after final cure.

2.3 KOSTER VAP I 2000 SYSTEM

- A. This one (1) coat system consists of one (1) coat of VAP I 2000 coating to be applied to a properly prepared concrete surface. Anhydrous calcium chloride testing performed by the Contractor having water vapor transmission levels greater than 3lbs/24 hrs per 1,000/sf. And less than 25lbs/ 24hrs per 1,000/sf. (depending on individual conditions) shall determine where this system is utilized and the coverage rates required. The Contractor shall supply a floor covering system and adhesive having the ability to withstand water vapor transmission levels up to 3lbs/24 hrs per 1,000/sf. The water vapor reduction system shall be required to reduce vapor emissions by a minimum of 90% after final cure. Verify water vapor reduction by anhydrous calcium chloride testing according to ASTM F 1869-98 prior to proceeding with any floor covering installation.

2.4 KOSTER VAP I 2000

- A. System consists on one (1) coat of VAP I 2000. Anhydrous calcium chloride testing according to ASTM F 1869-98 performed by the Contractor having water vapor transmission levels greater than 3lbs/24 hrs per 1,000/sf. and less than 25lbs/24 hrs per 1,000/sf (depending on individual conditions) shall determine where this system is utilized and the coverage rates required. The Contractor shall apply a floor covering system and adhesive having the ability to withstand water vapor transmission levels up to 3lbs/24 hrs per 1,000/sf. The water vapor reduction system shall be required to reduce water vapor emissions by a minimum of 90% after the final cure, as well as alkalinity reduction to acceptable pH levels. Verify water vapor reduction by anhydrous calcium chloride testing prior to proceeding with any floor covering installation.

2.5 AREA NOT REQUIRING VAPOR REDUCTION SYSTEM

- A. Water vapor reduction system is not required on interior concrete slabs without floor finishes.

2.6 MIX DESIGNS

- A. Use clean containers and mix thoroughly as per Manufacturer's requirements to obtain a homogenous mixture. Use a low speed motor less than 400 rpm and a two bladed jiffy mixing blade only. DO NOT AERATE. Mix ratios are measured by volume.
- B. VAP I 2000 Mix Ratio: Mix component A and B at a ratio of 2.4:1 by volume.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Calcium Chloride Test Requirements:

1. Anhydrous calcium chloride testing shall be performed by the Contractor.
2. Provide anhydrous calcium chloride tests according ASTM F 1869-98 in accordance to all surface preparation methods outlined. Tests shall be installed onto freshly abraded contaminant free concrete. No exceptions!
3. Only conduct calcium chloride tests at the same temperature and humidity expected during normal use. If this is not possible, than test conditions should be 75° F +/- 10° F and 50 +/- 10% relative humidity. Maintain these conditions 48 hours prior to and during testing. Water vapor transmission levels are directly affected by ambient room temperature and readings conducted without a sustained ambient temperature are NOT acceptable.
4. Contractor shall provide test results with a marked up floor finish plan showing test results. Contractor shall provide a written clarification on status of the ambient air temperature and humidity before and during the testing procedures.
5. Contractor shall provide a marked up floor plan showing areas with vapor reduction system recommendations.

B. Initial Calcium Chloride Tests:

1. Before installation of VCT, tile carpet, and wood athletic flooring systems over interior concrete slabs on grade, the Contractor shall make known the level of water vapor transmission in the slab in accordance to ASTM F 1869-98 to all parties involved. The Contractor will document the test results and provide recommendations on the type of moisture vapor reduction system to be utilized.
2. Surfaces to receive water vapor reduction system should be tested by an experienced firm to determine its suitability to receive a water vapor reduction system like Koster VAP I 2000.
3. Testing for concrete deficiencies and contaminants like un-reacted silicates, chlorides, A.S.R. (alkali-silica reaction), etc., is strongly recommended by Koster to avoid project failures.

C. Floor Treatment Calcium Chloride Tests:

1. After proper cure of the final coat of the water vapor reduction system the Contractor shall provide calcium chloride tests to determine if the level of water vapor transmission and alkalinity are reduced to the Architect's specified levels in conjunction with the flooring manufacturer's installation requirements. Contact Owner and water vapor reduction system manufacturer's representative concerning areas with a water vapor transmission level greater than the specified levels.

D. Adhesion Tests:

1. The Contractor shall verify proper adhesion of flooring adhesives, coating, and leveling compounds to the final vapor reduction coating system for acceptability. Contact manufacturer's Representatives for recommendations.

3.2 PREPARATION

- A. Inspect all surfaces with regard to their suitability to receive moisture vapor reduction system with manufacturer's representative.
- B. Clean all surfaces to receive moisture vapor reduction system. Shot blast all floors and clean surfaces with Shop Vac to remove all residue off the substrate. Remove ALL defective materials, and foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, shot blast bee bees, etc. Repair all cracks, expansion joints, control joints, and open surface honeycombs and fill in accordance with manufacturer's recommendations. Inform vapor reduction system manufacturer if concrete additives like chlorides or any other soluble compounds that can contaminate surfaces have been used in concrete mix. Reinforcing fibers must be burned off, scraped and vacuumed, after shop blasting, leaving no fibers left on the concrete surfaces. Provide uncontaminated, sound surface. DO NOT ACID ETCH!
- C. Repair concrete prior to moisture vapor reduction system installation by utilizing Koster SB Bonding Emulsion with approved concrete repair materials. Comply with all requirements as listed in Manufacturer's technical data information. No exceptions. Consult with vapor reduction manufacturer.
- D. Make sure that surfaces to be treated with moisture vapor reduction system have NOT previously been treated with other materials like underlayments, screeds, penetrating sealants, etc. If this is the case, consult with the manufacturer's Representative prior to any application of moisture vapor reduction system.
- E. Make sure that the substrate surface does not deteriorate due to the presence of sulphurous compounds or alkaline aggregate/silica reaction encountered in certain areas.
- F. Any testing for concrete deficiencies / contamination like alkaline silica reaction, untreated silicates, organic residue, etc., is the responsibility of the Building Owner.
- G. Koster American Corp. strongly advises that surfaces to be treated with Koster material inspected and evaluated by an experienced firm prior to application of Koster Systems to determine its suitability to receive the VAP I® System.
- H. Only a surface substrate that REMAINS uncontaminated, absorptive, and sound is fit to receive a water vapor reduction system. Comply with all requirements as listed in Manufacturer's technical data information.
- I. Proper removal of contaminants can render surfaces too rough for certain flooring systems. Therefore shot blast a small test area and verify with the flooring applicator that the surfaces are fit to receive the specified flooring system without the application of an underlayment on top of the VAP I 2000 System.

3.3 APPLICATION

A. VAP I 2000 SYSTEM APPLICATION

1. The coverage rates for this single Coat System depend on the surface texture and porosity of the substrate as well as the measured level of moisture, from Section 3.1 Examination. On average, coverage of 90-140 sq.ft./gal. can be expected.
2. Approximate coverage relative to existing levels of moisture vapor:

a. Up to 10 lbs/1000 sq.ft/24hr.	140 sq.ft/gallon
b. Up to 15 lbs/1000 sq.ft/24hr.	100 sq.ft/gallon
c. Up to 25 lbs/1000 sq.ft/24hr.	70 sq.ft/gallon

B. VAP I 2000 System Application: Apply one coat of VAP I 2000 at an average coverage rate of 70-140 sq. ft./gallon using a squeegee and or 3/8 inch nap roller leaving NO areas untreated. Allow to cure a minimum of 12 hours before installing flooring system. (See additional application instructions in Koster technical data sheets.)

C. Cementitious underlayment system Level-Pro with an epoxy primer Level-Pro Primer or approved equal if required by the Architect, Floor Covering Installer, or the Floor Covering Manufacturer may be used to level any smooth surfaces after shot blasting the floor on top of the water reduction system. The underlayment system utilized must be tested and approved (no exceptions) by the manufacturer of the water vapor reduction system prior to installation. No underlayment system containing gypsum will be allowed. When water based adhesives are utilized in the floor covering installation, use an approved underlayment system with primer prior to the installation of the flooring system. Please consult the adhesive manufacturer for their minimum recommended thickness of cementitious underlayment to absorb excess moisture in the adhesive. Leveling of the substrate shall not be considered part of the water vapor reduction system. No exceptions.

D. For installation of resilient flooring directly over the water vapor reduction system, the contractor responsible for installing the floor covering system shall use Koster VAS adhesives or approved equal. Use 100% solids adhesives or contact type adhesives with long working times that can be applied to substrates with a pH up to 10. The method of use is to apply the contact type adhesives to the substrate and allow the materials water to flash off prior to the flooring installation. Always test proper adhesion of adhesives to water vapor reduction system prior to installation of entire flooring system. No exceptions.

3.4 CLEANING

- A. Clean all tools and equipment with xylene immediately after use when using the VAP I 2000 System.
- B. Remove all debris resulting from water vapor reduction system installation from project site.

3.5 PROTECTION

- A. Protect each coat during specified cure period from any kind of traffic, topical water and contaminants.

END OF SECTION 09 69 90

SECTION 09 77 20 - DECORATIVE FIBERGLASS REINFORCED WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Prefinished polyester glass reinforced plastic sheets and adhered to unfinished gypsum wallboard, cementitious, untreated plywood, or existing flat, smooth, clean surfaces.
- B. PVC trim.
- C. Products Not Furnished or Installed under This Section: Gypsum and cementitious substrate board.

1.2 RELATED SECTIONS

- A. Section 09 29 00 – Gypsum [Cementitious] substrate board.
- B. Section 05 40 00 – Cold-Formed Metal Framing
- C. Section 06 10 00 – Rough Carpentry
- D. Section 09 91 23 – Interior Painting
- E. Section 09 65 13 - Resilient Base.

1.3 REFERENCES

- A. American Society for Testing and Materials: Standard Specifications (ASTM)
 - 1. ASTM D 790 – Flexural Strengths (psi)
 - 2. ASTM D 790 – Flexural Modulus (psi)
 - 3. ASTM D 638 – Tensile Strengths (psi)
 - 4. ASTM D 638 – Tensile Modulus (psi)
 - 5. ASTM D 2583 – Barcol Hardness
 - 6. ASTM D 256 - Izod Impact Strengths (ft #/in)
 - 7. ASTM D 696 – Thermal Coefficient of Lineal Expansion (in/in/F)
 - 8. ASTM D 570 – Water Absorption (%)
 - 9. ASTM D 792 – Specific Gravity
 - 10. ASTM D 3359 – Cross-cut Adhesion
 - 11. ASTM D 3273 – Mold & Mildew
 - 12. ASTM D 5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
 - 13. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data to indicate compliance with these specifications, including:
 - 1. Storage, handling and preparation instructions and recommendations.
 - 2. Installation instructions.
- B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- C. Selection Samples: Submit manufacturer's standard color pattern selection samples representing manufacturer's full range of available colors and patterns.
- D. Samples for Verification: Submit appropriate section of panel for each finish selected indicating the color, texture, and pattern required.
 - 1. Submit complete with specified applied finish.
 - 2. For selected patterns show complete pattern repeat.
 - 3. Exposed Trim Molding: Provide samples of each type, finish, and color.
- E. Manufacturers Safety Data Sheets (SDS) for adhesives, sealants and other pertinent materials prior to their delivery to the site (available as downloads for most Marlite's products at <http://www.marlite.com/tech-details.aspx> or by contacting Marlite at info@marlite.com).

1.5 QUALITY ASSURANCE

- A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with: ASTM E 84 (Method of test for surface burning characteristics of building Materials)
 - 1. Wall Required Rating – Class A or C.
- B. Sanitary Standards: System components and finishes to comply with:
 - 1. United States Department of Agriculture (USDA) / Food Safety & Inspection Services (FSIS) requirements for food preparation facilities, incidental contact.
 - 2. Food and Drug Administration (FDA) 2013 Food Code 6-101.11.
 - 3. Canadian Food Inspection Agency (CFIA) requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials factory packaged on strong pallets.
- B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels and adhesive to acclimate to room temperature (range of 60 to 75°F) for 48 hours prior to installation.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Building are to be fully enclosed prior to installation with heat (70° or similar room temperature) and ventilation consistent with good working conditions for finish work.
- B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
 - 1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

1.8 WARRANTY

- A. Furnish one-year guarantee against defects in material.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- A. Basis of Design: Marlite; 1 Marlite Drive, Dover, OH 44622. 800-377-1221 FAX (330) 343-4668 Email: info@marlite.com www.marlite.com.
- B. Product: Symmetrix™ SmartSeam FRP Panels with Sani-coat Sealer (BOD)

2.2 PANELS

- A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
 - 1. Finishing: BlueSky™ Advanced Finishing System: Spray-applied Sani-coat Sealer covers entire panel including grooves and features water-based coatings and controlled, low-temperature inline curing.
 - 2. Dimensions:
 - a. Thickness – 0.090” (2.29mm) nominal
 - b. Width – [4'-0” (1.22m)] nominal
 - d. Length – As indicated on the drawings
 - 3. Tolerance:
 - a. Length and Width: +/-1/8” (3.175mm)
 - b. Square - Not to exceed 1/8” for 4’ (1.2m) panels, 8’ (2.4m) panels or 5/32” (3.96mm) for 10’ (3.0m) panels

- B. Properties: Resistant to rot, corrosion, denting, peeling, and splintering.
 - 1. Flexural Strength – 0.9×10^4 psi per ASTM D 790.
 - 2. Flexural Modulus – 6.0×10^6 psi per ASTM D 790.
 - 3. Tensile Strength – 11.5×10^3 psi per ASTM D 638.
 - 4. Tensile Modulus – 0.45×10^6 psi per ASTM D 638.
 - 5. Barcol Hardness (scratch resistance) – 28 per ASTM D 2583.
 - 6. Izod Impact Strength – 6.0 ft. lbs./in ASTM D 256
 - 7. Thermal Coefficient of Lineal Expansion – 2.22×10^{-5} in/in/F per ASTM D 696
 - 8. Water Absorption – 0.15% per ASTM D 570.
 - 9. Specific Gravity – 1.8 per ASTM D 792.
 - 10. Cross-cut Adhesion – 0 removed per ASTM D 3359
 - 11. Mold & Mildew – Pass per ASTM D 3273.
 - 12. Standard Specification for FRP Wall Panels – per ASTM D 5319
 - 13. Standard Test Method Surface Burning Characteristics of Building Materials – Class A per ASTM E 84.

- C. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.

- D. Front Surface: Smooth [As Indicated on the Drawings]

- E. Marlite Symmetrix SmartSeam FRP Panels with Sani-coat Sealer are available in a variety of panel colors, groove colors, finishes, tile patterns, groove directions, tile sizes and panel sizes.

- F. Panel Color and Groove Color: As indicated at finish legend in the Construction Documents.

- G. Finish Gloss Level: As indicated at finish legend in the Construction Documents.

- H. Tile Pattern, Groove Direction, Tile Size & Panel Size: As indicated at finish legend in the Construction Documents.

- I. Fire Rating: Class A (I) Fire Rating.

2.3 TRIM MOLDING

- A. PVC Trim: Thin-wall semi-rigid extruded PVC. Use only as needed.
 - 1. M 350 Inside Corner, 8' and 10' lengths
 - 2. M 360 Outside Corner, 8' & 10' lengths
 - 3. M 370 Edge, 8' & 10' lengths
 - 4. Color: extruded custom harmonizing color

2.4 ACCESSORIES

- A. Adhesive: Either of the following construction adhesives complying with ASTM C 557.
 - 1. Marlite C-551 FRP Adhesive - Water-resistant, non-flammable adhesive. [3.5 gallon can]. Use over porous subwall only, such as unfinished drywall.

2. Titebond Advanced Polymer Panel Adhesive – VOC compliant, non-flammable, environmentally safe adhesive. [3.5 gallon can]. Use over non-porous subwall.
3. Marlite C-109 Low VOC Cartridge Adhesive required for interlocking SmartSeam Panels. [28-ounce cartridge]
4. Marlite MS-250 Clear Silicone Cartridge Sealant for interlocking SmartSeam Panels. [10-ounce cartridge]

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine sub wall to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
 1. Verify that stud spacing does not exceed 24” (61cm) on-center.
- B. Repair defects prior to installation.
 1. Level wall surfaces to panel manufacturer’s requirements. Remove protrusions and fill indentations.

3.2 INSTALLATION

- A. Comply with manufacturer's recommended procedures and installation sequence.
- B. Cut panels to meet supports allowing 1/8” (3 mm) clearance for every 8 feet (2.4m) of panel.
- C. Cut and drill with carbide tipped saw blades or drill bits or cut with shears.
- D. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.
- E. Install panels with manufacturer's recommended gap for panel field and corner joints.
- F. Adhesive trowel and application method to conform to adhesive manufacturer’s recommendations.
- G. For interlocking SmartSeam Panels (non-continuous vertical joints, i.e. subway groove configuration), apply Marlite C-109 Low VOC Cartridge adhesive using swirl technique at jagged panel edges.
- H. Apply panel moldings to all panel edges using silicone sealant providing for required clearances. All moldings must provide for a minimum 1/8” (3mm) of panel expansion at joints and edges, to insure proper installation. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.3 CLEANING

- A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.
- B. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION 09 77 20

SECTION 09 78 23 - INTERIOR PHENOLIC WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior decorative wall panels with different colors, sizes, thicknesses and textures, for the fabrication of:
 - 1. Wall paneling.

1.2 RELATED SECTIONS

- A. Section 06 20 00 - Finish Carpentry.
- B. Section 07 92 00 - Caulking and Sealants.
- C. Section 09 29 00 - Gypsum Board.

1.3 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. International Organization for Standardization (ISO):
- C. UL (Underwriters Laboratories) certification:
 - 1. GREENGUARD and GREENGUARD GOLD certification for chemical emissions.
- D. Forestry Stewardship Council (FSC™).

1.4 SUBMITTALS

- A. Product Data: Manufacturer's technical data on the product, including:
 - 1. Material Property Datasheet (MPD)
 - 2. Machining and installation general guidelines.
 - 3. Storage and handling recommendations.
 - 4. Cleaning recommendations.
- B. Verification Samples: For each finish product specified, samples of a minimum of 3.5 inches by 3.5 inches (89 mm by 89 mm) representing actual product, color, and patterns. Sample edges may vary from field panel edges.
- C. 10 years warranty.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All panel products specified in this section will be supplied by a single manufacturer with 60 years of experience and with the following certifications:
 - 1. ISO 9001.
 - 2. ISO 14001.
- B. Installer Qualifications: All products listed in this section are to be installed by an installing firm who can prove evidence of installing wall panel systems.

1.6 TRANSPORT, STORAGE AND HANDLING

- A. Transport:
 - 1. Transport panels using machinery recommended by manufacturer or having sufficient capacity and features to meet manufacturer's recommendations.
 - 2. Secure and provide protective materials for transport of panels in accordance with manufacturer's recommendations.
- B. Storage: Store panels horizontally in protective, suitable environmental conditions as recommended by manufacturer.
- C. Handling: Handle panels according to manufacturer's recommendations.

1.7 PROJECT CONDITIONS

- 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 absolute limits.

1.8 WARRANTY

- A. Warranty: Formica warrants to the buyer to which Formica has sold its Panel(s) (the "Buyer"), for a period of ten (10) years after the date of delivery of the Panel(s) to the Buyer, that the Panel(s) conform to the specifications stated in the Material Properties Datasheet for the Panel(s) published on the date of delivery.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer's Representative: Formica Corporation, 10155 Reading Road, Cincinnati, OH, 45241, United States.

2.2 PRODUCTS

- A. Basis of Design Product: Trespa® TopLab® VERTICAL.

1. Description: Compact, homogeneous high-pressure laminate sheets (also known as phenolic resin panels) consisting of layers of natural fibers (wood) impregnated with phenolic resins and acrylic-based surface layer(s) on one or both sides, having decorative colors or designs, acrylic clear surface coat, and cured with manufacturer's Electron Beam Curing (EBC) method.
2. Panel Attributes:
 - a. Smooth machineability.
 - b. Scratch resistance.
 - c. Impact resistance.
 - d. Chemical resistance.
 - e. Resistance to many aggressive cleaning chemicals.
 - f. Does not support bacterial growth.
 - g. Suitable for hygienic applications.
3. Panel Core: Fire retardant (FR) black core.
4. Panel Facing: Manufacturer's standard acrylic sheets with acrylic clear coat, cured with manufacturer's proprietary Electron Beam Curing method.
5. Panel Size: 1828 by 2438 mm(6 by 8 feet) 1524 by 3048 mm(5 by 10 feet) (coordinate with drawings).
6. Panel Thickness: 10mm (3/8 inch).
7. Panel Type: Single sided.
8. Panel Decor: Selected from manufacturer's full range of Uni Colors, Wood Decors, Naturals, Metallics, Lumen and Focus color lines.

2.3 PERFORMANCE

- A. Performance Properties: See Manufacturer's latest certifications and Material Product Datasheet for properties and performance on www.trespa.info.

2.4 FABRICATION

- A. Fabricate solid phenolic panels according to manufacturer's recommendations and approved submittals.

PART 3 - EXECUTION

3.1 Acclimate and prepare panels according to manufacturer's written instructions prior to fabrication.

- A. Remove protective materials from panels immediately prior to fabrication.

3.2 PREPARATION

- A. Acclimate panels according to manufacturer's written instructions prior to fabrication.
- B. Prior to beginning installation of work surfaces, inspect and verify that no irregularities in jobsite conditions exist that would affect quality of execution of the work as specified.

3.3 INSTALLATION

- A. Install panels per specification, as shown on shop drawings, and per manufacturer's recommendations.

- B. Install the work so as to satisfy all warranty requirements.
- C. Coordination: Coordinate the work of this Section with the schedule and requirements of other work being performed in the area at the same time including, but not limited to, general construction work, mechanical and electrical connections to and in the fume hoods and other similar or related work.

3.4 CLEANING

- A. Clean surfaces of Trespa TopLab VERTICAL as recommended by manufacturer in writing, and as follows:
 - 1. General: The surfaces of Trespa TopLab VERTICAL can be easily cleaned with a dry or damp cloth and a mild household cleaner, or water and soap. Wipe damp surfaces with an absorbent cloth. It is not recommended to use concentrated acid, caustics, abrasives, or polishing agents.
 - 2. Severe Soiling: Hot water and an interior detergent- or soap-based cleaning agent, applied with a sponge or soft nylon brush. Apply the diluted cleaning agent to the surface and leave it to soak. Then rinse off with clean water and dry with an absorbent cloth. It may be necessary to remove old stains or very stubborn marks with bleach. Wash the surface down thoroughly afterwards with clean water and dry with an absorbent cloth.
 - 3. Special Staining: Solvent-based varnishes and adhesives and other soluble but strong stains should be removed with organic solvents such as acetone, white spirit, turpentine or petroleum.

3.5 DISINFECTING

- A. Disinfect surfaces as recommended by manufacturer, using commonly used disinfectants such as the following:
 - 1. Alcohol, preferably 60-70 % solution in water.
 - 2. Peroxide compounds (hydrogen peroxide and organic peracids).
 - 3. Quaternary ammonia compounds.

END OF SECTION 09 78 23

SECTION 09 84 00 - SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Acoustic Suspended Ceiling and Wall Panels.

1.2 RELATED SECTIONS

- A. Section 09 84 33 - Sound-Absorbing Wall Units
- B. Section 09 84 36 - Sound-Absorbing Ceiling Units
- C. Section 05 31 00 - Steel Decking: for products being suspended from steel decking
- D. Section 09 11 10 - Non-Loadbearing Metal Framing: for products being coordinated with non-loadbearing framing
- E. Section 09 26 00 - Gypsum Board Assemblies: for products attaching to or coordinating with gypsum
- F. Section 09 51 10 - Suspended Acoustical Ceilings: for grid supported ceilings
- G. Section 09 90 00 - Paints and Coatings: for understanding and coordinating the finish of adjacent or coordinated surfaces
- H. Section 23 00 00 – Heating, Ventilating, and Air Conditioning: for products being coordinated around ducts or air diffusers
- I. Section 26 51 00 – Interior Lighting: for products coordinated with the lighting system

1.3 REFERENCES

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2009a.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- C. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests; 2016.
- D. CAN/ULC-S102.2 – Standard Method of Test for Surface Burning Characteristics; 2018.
- E. ASTM D5116 – Standard Test for Measuring VOC emitted.

1.4 SUBMITTALS

- A. General: Submit manufacturer's documentation for each type of product under provisions of Section 01 30 30 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, panel layout.
- D. Selection Samples: Manufacturer's color charts for applicable material, indicating full range of material, colors, and patterns available.
- E. Verification Samples: Fabricated samples of each type of product specified; 6" minimum length and width, showing construction, edge details.
- F. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.
- G. Maintenance Materials: Furnish maintenance information and recommendations for Owners use.

1.5 QUALITY ASSURANCE

- A. Source Limitations: All similar products to be obtained from a single manufacturer through one source providing a comprehensive material and installation package.
- B. Installer Qualifications: Utilization of an installer with demonstrated experience and quality in projects of similar size and complexity.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation. Ensure all supplied hardware, material, and components are maintained until product is fully installed.
- B. Store units flat, in dry, well-ventilated space; do not stand on end.
- C. Protect edges from damage.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install materials until spaces are enclosed from the exterior environment, wet work in spaces is complete and dry, and HVAC system is maintaining an ambient temperature at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Installer to verify field measurements and dimensions as indicated in Shop Drawing.

1. Coordinate location of other product and trades with product layout.
- C. Ensure that Shop Drawing or Product Order Form signoffs and other required information are supplied in time to prevent interruption of construction process. Ensure that products of this section are supplied to affected trades in time to prevent interruptions.

1.8 WARRANTY

- A. Special Warranty: Refer to manufacturer's standard warranty for specific products, terms, and limitations.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Acceptable Manufacturer: Turf Design; Located at 41 Prairie Pkwy, Gilberts, IL 60136; Phone: 844.TURF.OMG (844.887.3664); Email: hello@turf.design; Web: www.turf.design
- B. Substitutions: Not permitted.

2.2 SOUND-ABSORBING AND SOUND-DIFFUSING PANELS

- A. Basis of Design:
 1. Turf Design; Product: GRILLE PANEL <https://turf.design/>
- B. Material Minimum Performance Attributes:
 1. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 2. UL Tested ASTM E-84: Class A
 3. CAN/ULC-S102.2 Compliant
 4. Noise Reduction Coefficient (NRC):
 - a. ASTM E795: E400 Mounting (Ceiling with 400MM Plenum) - Each unit consisted of four (4) panels installed without gaps. Each panel measured 24"x 48". The specimen consisted of four full units arranged in a continuous array.
 - 1) Typical panel type G6: apparent NRC > 1.00 or greater.
 - b. ASTM E795: F-13 Mounting (Wall – 13MM Standoff) - Each assembly consisted of four (4) panels installed without gaps. Each panel measured 24"x 120". The specimen consisted of four full units arranged in a continuous array.
 - 1) Typical panel type G6: apparent NRC > .75 or greater.
 5. VOC: ASTM D5116 compliant

C. Product Attributes:

1. Panel Size: As indicated by manufacturer and per Architects approval.
2. Panel Thickness: As indicated by manufacturer and per Architects approval.
3. Edges: Exposed felt, machined edge.
4. Corners: Square, exposed felt, machined edge.
5. Material: Polyester (PET) felt, 60% pre-consumer recycled.
6. Color: As selected by Architect from manufacturer's full range.
7. Patterns: As selected by Architect from manufacturer's full range.
8. Mounting Method: Direct connection to 15/16" flat Tee Grid installed at 24" on center unless noted otherwise by manufacturer.

2.3 FABRICATION

- A. General: CNC fabricate panels to sizes, configurations, and patterns on PET felt assembly (9mm PET felt board with folded edge construction). Integrated support and mounting hardware factory installed.
- B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and square-ness from corner to corner.

2.4 ACCESSORIES

A. Ceiling-Suspended Accessories:

1. Contractor to provide and install supporting components as required for installation. Refer to installation drawings (provided upon production kickoff) for hardware details, locations, and inclusions.
 - a. Suspend product at elevations indicated by the Architects drawings.
2. Contractor to select and provide all anchors to building for mounting based on site requirements, conditions, and as appropriate for application.
3. Optional factory installed end caps for Grille panels. Provided by request only, additional pricing may apply.
4. Optional felt infill panels for 24"x24" square Tee Grid installation available for additional acoustic performance. Provided by request only, additional pricing may apply.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected. Notify manufacturer immediately of any damage.

3.2 INSTALLATION

- A. Install acoustical units in locations indicated, following manufacturer's installation instructions and in accordance with local jurisdiction authorities.
- B. Align panels accurately, with edges plumb and top edges level.
- C. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
 - 1. Plumb and level.
 - 2. Flatness.
 - 3. Width of joints.
- D. This product cannot be field trimmed unless noted otherwise.

3.3 CLEANING

- A. Clean felt facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.
- B. Vacuum occasionally to remove any particulate matter and air-borne debris or dust. Compressed air can be used to dust the material in difficult to reach areas or for large assemblies.

3.4 PROTECTION

- A. Provide protection of installed acoustical panels until completion of the work.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION 09 84 00

SECTION 09 84 33.11 - SOUND ABSORBING WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Sound-absorbing wall panels, custom-fabricated and metal-encased.

1.2 REFERENCES

- A. ASTM International
 - 1. ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 2. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3. ASTM E795 Standard Practices for Mounting Test Specimens During Sound Absorption Tests.

1.3 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. Surface Burning Characteristics (ASTM E84):
 - a. Flame Spread: 25 maximum.
 - b. Smoke Developed: 450 maximum.

1.4 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
- B. Product Data: Submit product data sheet, for specified products.
- C. Shop Drawings: Submit shop drawings showing layout, edge profiles and panel components, including anchorage, accessories, finish colors and textures.
- D. Samples: Submit selection and verification samples of finishes, colors and textures.
- E. Test Reports: Certified test reports showing compliance with specified performance requirements.
 - 1. Standard Systems: Submit certified copies of previous test reports substantiating performance of system in lieu of retesting.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with Division 1 Product Requirements Section.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1.6 PROJECT CONDITIONS

- A. Environmental Requirements: Do not install panels until wet work, such as concrete and plastering, is complete; the building is enclosed; and the temperature and relative humidity are stabilized at 60 - 80 degrees F (16 - 27 degrees C) and 35% MINIMUM RH and 55% MAXIMUM RH, respectively. All products constructed with wood or wood fiber content must be stored for at least 72 hours in the controlled environment specified herein prior to installation to allow the materials to stabilize.

PART 2 - PRODUCTS

2.1 SOUND-ABSORBING WALL PANELS

- A. Manufacturers:
 - 1. Kinetics Noise Control, Inc. (BOD)
 - a. Contact: PO Box 655, 6300 Irelan Place, Dublin, OH 43017; Telephone: (614) 889-0480; Fax: (614) 889-0540; E-mail: intsales@kineticsnoise.com; Web site: www.kineticsnoise.com.
- B. Substitutions: Will be permitted if they meet all criteria in Specification.
- C. Single Source: Provide materials from a single manufacturer.

2.2 MANUFACTURED UNITS

- A. KNP Perforated Metal Panels:
 - 1. Model KNP-V thickness: 2 inches (51 mm) at perimeter and 2-3/4 inches (70 mm) at the V-ridges.
 - 2. Size: As indicated on the drawings.
 - a. Standard sizes for V-ridge (KNP-V) panels: up to 36 inches wide × 120 inches high (914 mm × 3048 mm) or 96 inches wide × 48 inches high (2438 mm × 1219 mm). Available in larger sizes up to 48 inches wide x 144 inches high (1219 mm x 3658 mm) or 132 inches wide x 60 inches high (3353 mm x 1524 mm) as special

order. Note: KNP-V panels are sized in increments of 6 inches (152 mm), the width of each V-ridge. Minimum panel size is 12 inches (305 mm) wide.

3. Construction: 0.040 inch (1.02 mm) medium duty aluminum face, perforated with 3/32 inch (2.4 mm) holes on 3/16 inch (4.8 mm) staggered centers, providing 23% open area. 0.040 aluminum channel/stiffener framing. 2 inches (51 mm) thick, fibrous insulation sound absorber encased in 2.5 mil thick black poly embossed vinyl.
4. Finish: Manufacturer's standard powder coated paint finish.
 - a. Color: Match Architect's sample.
5. Sound Absorption (ASTM C423, A mounting): Noise Reduction Coefficient of 0.90.
6. Mounting Accessories: Refer to finish drawings in the Construction Documents.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2 EXAMINATION

- A. Site Verification of Conditions: Verify that substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
 1. Verify that stud spacing is 16 inches (406 mm) o.c., maximum, for panels installed over open studs.
 2. Do not install panels until unsatisfactory conditions are corrected.

3.3 CLEANING

- A. Follow manufacturer's instructions for cleaning panels soiled during installation. Replace panels that cannot be cleaned to as new condition.
- B. Keep site free from accumulation of waste and debris.

END OF SECTION 09 84 33.11

SECTION 09 91 23 - 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. This Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete masonry units (CMU)
 - 2. Steel
 - 3. Gypsum board
- B. Related Sections include the following:
 - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 09 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
 - 3. Division 09 Section "High Performance Coatings".

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Paint Swatches / Color Samples.

1.4 QUALITY ASSURANCE

- A. MPI Standards:
 - 1. Products: Complying with MPI standards where indicated and listed in "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Sherwin Williams
 - 2. PPG Architectural Finishes, Inc.
 - 3. Benjamin Moore

2.2 PAINT, GENERAL

- A. 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.
- B. Colors: Indicated in the construction drawings.

2.3 PRIMERS/SEALERS

- A. Interior Latex Primer/Sealer: Speed Hide Interior Latex Quick Drying Sealer 6-2.(MPI# 50).
 - 1. VOC Content: E Range of E2.
 - 2. Environmental Performance Rating: EPR 2.
- B. Alkali Resistant Primer: Perma-crete .4-603 (MPI# 3)

2.4 METAL PRIMERS

- A. Interior Latex Primer (Water Based): Pitt Tech In/Ex DTM Primer/Finish 90-712.
 - 1. VOC Content: E Range of E2

2.5 LATEX PAINT

- A. Low-Odor/VOC Latex (Eggshell): Pure Performance Interior Eggshell Finish 9-310.
 - 1. VOC Content: E Range of E3.
 - 2. Environmental Performance Rating: EPR 4.5.
- B. Low-Odor/VOC Latex (Semi gloss): Pure Performance Interior Semi Gloss Finish 9-510.
 - 1. VOC Content: E Range of E3.
 - 2. Environmental Performance Rating: EPR 3

2.6 ACRYLIC PAINT

- A. Interior/Exterior Semi Gloss DTM Enamel: 90-1210 (MPI# 163)
 - 1. VOC Content: E Range of E2.

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 work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Masonry (Clay and CMU): 12 percent.
 - 2. Gypsum Board: 12 percent.

- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that 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.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Masonry Substrates: Remove 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. Prep ground face CMU to receive paint. Remove existing graffiti sealer. Provide adhesion testing all locations.
- F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- G. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 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.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
 - C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
 - D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
 - E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
 1. Mechanical Work:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Tanks that do not have factory-applied final finishes.
 - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
 2. Electrical Work:
 - a. Panelboards on occupied areas.
 - b. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
 1. Owner will engage the services of a qualified testing agency to sample paint materials 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 with product requirements.

3. Owner may direct Contractor to stop applying paints 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.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Low-Odor/VOC Latex System:
 - a. Primer: Loxon Concrete and Masonry Primer
 - b. 1st Coat: ProMar 200HP Zero VOC semi-gloss
 - c. 2nd Coat: ProMar 200HP Zero VOC semi-gloss

B. Concrete Substrates, Moisture Barrier Spaces: (POOL ADDITION & POOL LOCKER ROOM)

1. Low-Odor/VOC Latex System:
 - a. Primer: Moisture Vapor Barrier Interior Primer
 - b. 1st Coat: Pro Industrial Waterbased Catalyzed Epoxy, Eggshell or Gloss
 - c. 2nd Coat: Pro Industrial Waterbased Catalyzed Epoxy, Eggshell or Gloss

C. CMU Substrates:

1. Low-Odor/VOC Latex System:
 - a. Primer: PrepRite Block Filler
 - b. 1st Coat: ProMar 200HP Zero VOC semi-gloss
 - c. 2nd Coat: ProMar 200HP Zero VOC semi-gloss

D. CMU Substrates: (POOL ADDITION & POOL LOCKER ROOM)

1. Low-Odor/VOC Epoxy System: (Eggshell Finish)

- a. Primer: PrepRite Block Filler
- b. 1st Coat: Pro Industrial Waterbased Catalyzed Epoxy, Eggshell or Gloss
- c. 2nd Coat: Pro Industrial Waterbased Catalyzed Epoxy, Eggshell or Gloss

E. Steel Substrates:

1. Low-Odor/VOC Alkyd Urethane:

- a. Primer: Pro Industrial ProCryl Universal Primer
- b. 1st Coat: Pro Industrial Waterbased Alkyd Urethane
- c. 2nd Coat: Pro Industrial Waterbased Alkyd Urethane

Note: Gas piping to receive 2 coats of primer and two topcoats (yellow) interior and exterior.

F. Steel Substrates: (POOL ADDITION & POOL LOCKER ROOM)

1. Low-Odor/VOC Epoxy System:

- a. Primer: Pro Industrial Pro-Cryl
- b. 1st Coat: Pro Industrial Waterbased Catalyzed Epoxy, Eggshell or Gloss
- c. 2nd Coat: Pro Industrial Waterbased Catalyzed Epoxy, Eggshell or Gloss

G. Pool Acoustical Roof Deck (EPIC Metals)

- 1. EPIC requires using Tnemec 113 to be field applied finish coat.
- 2. The painting contractor is responsible for the spray – apply application, using an airless sprayer fit with a wide-tip is to be used in a controlled manner to evenly “mist-apply” or fog the finish color coat over the Natacoat primer without filling 1 /8” diameter holes. Test area suggested for review and approval to proceed recommended by EPIC.

H. Hollow Metal Doors and Frames:

1. Low-Odor/VOC Alkyd Urethane:

- a. Primer: Pro Industrial ProCryl Universal Primer
- b. 1st Coat: Pro Industrial Waterbased Alkyd Urethane
- c. 2nd Coat: Pro Industrial Waterbased Alkyd Urethane

I. Hollow Metal Doors and Frames: (POOL ADDITION & POOL LOCKER ROOM)

1. Low-Odor/VOC Epoxy System:

- a. Primer: Pro Industrial Pro-Cryl
- b. 1st Coat: Pro Industrial Waterbased Catalyzed Epoxy, Eggshell or Gloss
- c. 2nd Coat: Pro Industrial Waterbased Catalyzed Epoxy, Eggshell or Gloss

J. Gypsum Board Substrates:

1. Low-Odor/VOC Latex System:

- a. Enamel Eggshell Latex.
Primer: ProMar 200 Zero Primer
1st Coat: ProMar 200HP Zero VOC eggshell
2nd Coat: ProMar 200HP Zero VOC eggshell
- b. Semigloss Acrylic Latex:
Primer: ProMar 200 Zero Primer
1st Coat: ProMar 200HP Zero VOC semi-gloss
2nd Coat: ProMar 200HP Zero VOC semi-gloss

K. Gypsum Board Substrates, Vapor Barrier: (POOL ADDITION & POOL LOCKER ROOM)

1. Low-Odor/VOC Epoxy System:

- a. Enamel Egg Shell Epoxy:
Primer: Multipurpose Interior/Exterior Latex
1st Coat: Pro Industrial Waterbased Catalyzed Epoxy, Satin
2nd Coat: Pro Industrial Waterbased Catalyzed Epoxy, Satin
- b. Gloss Epoxy System:
Primer: Multipurpose Interior/Exterior Latex
Primer Sealer Finish: Pro Industrial Waterbased Catalyzed Epoxy
Eggshell or Gloss
1st Coat: Pro Industrial Waterbased Catalyzed Epoxy, Semi-Gloss
2nd Coat: Pro Industrial Waterbased Catalyzed Epoxy, Semi-Gloss

L. Steel Substrates:

1. Interior Steel Handrails

- a. Primer: 1 coat Pro Industrial ProCryl Universal Primer
- b. 1st Coat: Pro Industrial Waterbased Catalyzed Epoxy Gloss
- c. 2nd Coat: Pro Industrial Waterbased Catalyzed Epoxy Gloss

END OF SECTION 09 91 23

SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS

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 surface preparation and field application of high-performance coating systems to all exterior exposed steel and Bus Wash CMU walls and precast concrete ceiling.
- B. Related Sections include the following:
 - 1. Division 5 Section "Structural Steel" for shop priming structural steel.
 - 2. Division 9 Section "Painting" for general field painting.

1.3 DEFINITIONS

- A. Standard coating terms defined in ASTM D 16 apply to this Section.
- B. Gloss ranges used in this Section include the following:
 - 1. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
 - 2. High gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.
- C. Environments: The following terms are used in Part 2 of this Section to distinguish between different corrosive exposures:
 - 1. "Severe environments" are highly corrosive industrial atmospheres with sustained exposure to high humidity.

1.4 SUBMITTALS

- A. Product Data: For each coating system indicated. Include primers.
 - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference the specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.

2. **Manufacturer's Information:** Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each material specified.
- B. **Certification by manufacturer** that products supplied comply with requirements indicated that limit the amount of VOCs in coating products.
- C. **Samples for Verification:** For each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate.
 1. Provide stepped Samples defining each separate coat, including primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. List of material and application for each coat of each sample. Label each sample for location and application.
 3. Submit samples on the following substrates for Architect's review of color and texture:
 - a. **Ferrous and Nonferrous Metal:** Provide two 4-inch- square samples of flat metal and two 8-inch- long samples of solid metal for each color and finish.
- D. **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.
- E. **Coating Maintenance Manual:** Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 QUALITY ASSURANCE

- A. **Applicator Qualifications:** Engage an experienced applicator who has completed high-performance coating system applications similar in material and extent to those indicated for Project and whose work has a record of successful in-service performance.
- B. **Source Limitations:** Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:
 1. Name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.

4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. Handling instructions and precautions.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect materials from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

1.7 PROJECT CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 45 and 95 deg F.

B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before proceeding with or continuing coating operation.
2. Work may continue during inclement weather only if areas and surfaces to be coated are enclosed and temperature within the area can be maintained within limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

A. Furnish extra high-performance coating materials from the same production run as materials applied and in quantities described below. Package coating materials in unopened, factory-sealed containers for storage and identify with labels describing contents.

1. Quantity: Furnish extra coating materials in quantities indicated below:
 - a. High-Gloss, Aliphatic Polyurethane Enamel: One case of each color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products indicated in the coating system descriptions.

- B. **Manufacturers' Names:** The following manufacturers are referred to in the coating system descriptions by shortened versions of their names shown in parenthesis:
 1. Sherwin Williams; Industrial and Marine Coatings (S-W).
 2. Moore: Benjamin Moore & Co. (Moore).
 3. Pittsburgh Paint; PPG Industries, Inc. (PPG).

2.2 COATINGS MATERIALS, GENERAL

- A. **Material Compatibility:** Provide primers, undercoats, and finish-coat materials 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.
- B. **Material Quality:** Provide manufacturer's highest grade of the various high-performance coatings specified. Materials not displaying manufacturer's product identification are not acceptable.
 1. **Proprietary Names:** Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. **VOC Classification:** Provide high-performance coating materials, including primers, undercoats, and finish-coat materials, that have a VOC classification of 450 g/L or less.

2.3 COLORS

- A. **Colors:** As selected by Architect from manufacturer's full range. Refer to construction drawings.

2.4 METAL HIGH-PERFORMANCE COATING SYSTEMS **(Exterior Exposed Steel and Bus Wash Walls & Ceiling).**

- A. **Exterior Structural Steel Beams, Girts and Supports:** Provide the following finish systems over exterior ferrous-metal surfaces:
 1. **Severe Environment (High-Gloss Finish):** One finish coat over an intermediate coat and a primer.
 - a. **Primer:** Sherwin Williams MacroPoxy 646 Fast Cure Epoxy.
 - b. **Finish (2 coats):** Sherwin Williams Acrolon 218 HS Acrylic Polyurethane B65-600 Series.

2.5 BUS WASH CMU & PRECAST CONCRETE CEILING

- A. **1 Coat Kem-Cati Coat HS Epoxy Filler/Sealer. (CMU Walls)**

- B. 2 Coat Macropoxy 646 Fast Cure Epoxy. (CMU Walls and Precast Ceiling)
- C. 1 Coat Acrolon 218 HS Polyurethane. (CMU Walls and Precast Ceiling)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. With Applicator present, examine substrates and conditions under which high-performance coatings will be applied, for compliance with coating application requirements.
 - 1. Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry. All surfaces must be cleaned and prepped as recommended and approved by paint manufacturer.
 - 2. Start of application is construed as Applicator's acceptance of surfaces within that particular area.
- B. Coordination of Work: Review other Sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of specified finish materials to ensure compatible primers.
 - 1. If a potential incompatibility of primers applied by others exists, obtain the following from the primer Applicator before proceeding:
 - a. Confirmation of primer's suitability for expected service conditions.
 - b. Confirmation of primer's ability to be top coated with materials specified.
 - 2. Notify Architect about anticipated problems before using the coatings specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 - 1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
- B. Cleaning: Before applying high-performance coatings, clean substrates of substances that could impair bond of coatings. Remove oil and grease before cleaning. All rust must be removed down to the bare metal. Paint manufacturer must approve all cleaned existing steel framing before paint system is to be applied.
 - 1. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.

- C. Surface Preparation: Clean and prepare surfaces to be coated according to manufacturer's written instructions for each substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove primers and reprime substrate.
 - 2. Ferrous-Metal Substrates: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC recommendations.
 - a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, solvent clean, and touch up with same primer as the shop coat.
- D. CMU Substrates: Remove efflorescence and Chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- E. Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.
 - 1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
 - 2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
 - 3. Use only the type of thinners approved by manufacturer and only within recommended limits.
- F. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply high-performance coatings according to manufacturer's written instructions.
 - 1. Use applicators and techniques best suited for the material being applied.
 - 2. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
 - 3. Coating colors, surface treatments, and finishes are indicated in the coating system descriptions.
 - 4. Provide finish coats compatible with primers used.
- B. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. The number of coats and film thickness required is the same regardless of application method.

- a. Omit primer on metal surfaces that have been shop primed and touchup painted.
 - b. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
 - c. Where manufacturer's written instructions require sanding, sand between applications to produce a smooth, even surface.
 - d. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat does not cause undercoat to lift or lose adhesion.
2. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance. Give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.
- C. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brush Application: Use brushes best suited for material applied and of appropriate size for the surface or item being coated.
 - a. Apply primers and first coats by brush unless manufacturer's written instructions permit using roller or mechanical applicators.
 - b. Brush out and work brush coats into surfaces in an even film.
 - c. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for the material and texture required.
 3. Spray Equipment: Use mechanical methods to apply coating if permitted by manufacturer's written instructions and governing regulations.
 - a. Use spray equipment with orifice size recommended by manufacturer for material and texture required.
 - b. Apply each coat to provide the equivalent hiding of brush-applied coats.
 - c. Do not double back with spray equipment building-up film thickness of two coats in one pass, unless recommended by manufacturer.
- D. Minimum Coating Thickness: Apply each material no thinner than manufacturers recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by manufacturer, to material required to be coated or finished that has not been prime coated by others.
1. Recoat primed and sealed substrates if there is evidence of suction spots or unsealed areas in first coat, to ensure a finish coat with no burn-through or other defects caused by insufficient sealing.

- F. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

3.4 CLEANING

- A. Cleanup: At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
 - 1. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

3.5 PROTECTION

- A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
 - 1. Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.
 - 2. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces. Comply with procedures specified in PDCA P1.

END OF SECTION 09 96 00

SECTION 10 11 00 - 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.
 - 2.
 - 3. Glass White Board
 - 4. Fabric wrapped tackboard panels

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation 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, 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. Include sections of typical trim members.
- C. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:
 - 1. Samples of facings for each visual display panel type, indicating color and texture.
 - 2. Fabric swatches of fabric facings for tackboards.
 - 3. Actual factory-finish color samples, applied to aluminum substrate.
 - 4. Include accessory Samples to verify color selected.
- D. Samples for Verification: For each type of visual display unit indicated.
 - 1. Visual Display Panel: Not less than 8-1/2 by 11 inches, with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.

2. Trim: 6-inch-long sections of each trim profile.
3. Accessories: Full-size Sample of each type of accessory.

E. Product Schedule: For visual display units.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of tackboards.
- C. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For visual display units 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 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.

1.9 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.

1.10 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces exhibit crazing, cracking, or flaking.
 - 2. Warranty Period: 50 years from date of Substantial Completion.

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: 450 or less.

2.3 VISUAL DISPLAY BOARD ASSEMBLY.

- A. Visual Display Board Assembly: factory fabricated.
 - 1. Description: Whiteboard
 - a. Manuf: Mooreco Contract
 - b. Model: Inspire Series
 - c. Remarks: Porcelain Markerboard/Glossy white with anodized alum. frame tack rail and tray / www.mooreco360.com
 - d. Refer to Equipment Schedule for sizes.
 - 2. Description: Glass White Board
 - a. Manuf: Carvart
 - b. Model: Flush Frame
 - c. Refer to Equipment Schedule for sizes

2.4 FABRIC WRAPPED

A. TEXTILE FINISHES:

1. Refer to Room Finish Schedule

2.5 MATERIALS

- A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.
- B. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.

2.6 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.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

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 roughing-in for electrical power systems to verify actual locations of connections before installation of motorized, sliding visual display units.
- C. Examine walls and partitions for proper preparation and backing for visual display units.
- D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- E. 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.
- D. Prime wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.
- E. Prepare recesses for sliding visual display units as required by type and size of unit.

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: 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.
- C. 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. As indicated on Drawings.

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 10 11 00

SECTION 10 14 00 - 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. This Section includes the following:
 - 1. Panel signs
- B. Related Sections include the following:
 - 1. Division 22 Section "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
 - 2. Division 23 Section "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
 - 3. Division 26 Sections for electrical service and connections for illuminated signs.
 - 4. Division 26 Section "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
 - 5. Division 26 Section "Interior Lighting" for illuminated Exit signs.

1.3 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details for signs.
 - 1. Show sign mounting heights, locations of supplementary supports and accessories.
 - 2. Provide message list, tpestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

- B. Samples for Verification: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:
 - 1. Acrylic sheet – 8 x 10 inch for each required color.
 - 2. Dimensional Characters: Full size sample of each type.
- C. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
- D. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing signs.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which 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 metal and polymer finishes beyond normal weathering.

- b. Deterioration of embedded graphic image colors and sign lamination.
2. Warranty Period: Standard Limited Lifetime Warranty against material and manufacturer defects.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. InPro Corporation
- B. Ark Ramos Signage Systems
- C. Gemini Incorporated

2.2 MATERIALS

- A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
- B. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, coated on both surfaces with abrasion-resistant coating:
 1. Impact Resistance: 16 ft-lbf/in. per ASTM D 256, Method A.
 2. Tensile Strength: 9000 lbf/sq. in. per ASTM D 638.
 3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. per ASTM D 790.
 4. Heat Deflection: 265 deg F at 264 lbf/sq. in. per ASTM D 648.
 5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.

2.3 PANEL SIGNS

- A. Refer to Architectural Drawing Set for types.
- B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements: (Basis of Design is In-Pro Corporation)
 1. Laminated, Polycarbonate-Faced Sheet: .080" thick, polycarbonate face sheet laminated to .040" thick base sheet.
 2. Edge Condition: Square cut.
 3. Corner Condition: Rounded to radius indicated and square.
 4. Mounting: Unframed.
 - a. Wall mounted with two-face foam tape.
 5. Color: As selected by Architect. Refer to Architectural Drawing Set.

6. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch above surface with contrasting colors.
 7. Text Style: Refer to Architectural Drawing Set.
- C. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
1. Panel Material: Opaque acrylic sheet.
 2. Raised-Copy Thickness: Not less than 1/32 inch.
- D. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are UV and water resistant for five years for application intended.
1. Color: As selected by Architect. Refer to Architectural Drawing Set.

2.4 ACCESSORIES

- A. Anchors and Inserts: Provide stainless steel anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.5 FABRICATION

- A General: Provide manufacturer's standard signs of configurations indicated.
1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
 2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
 3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
 4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

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.

2.7 ACRYLIC SHEET FINISHES

- A. Colored Coatings for Acrylic Sheet: For copy background and frame colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.

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 work.
- B. Verify that items, including anchor inserts, are sized and located to accommodate signs.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.

1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for glass, vinyl-covered or rough surfaces.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 10 14 00

SECTION 10 14 19 - 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. Cast dimensional characters.
 - 2. Illuminated, fabricated channel dimensional characters and cast logo to match.

1.3 DEFINITIONS

- A. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.4 COORDINATION

- A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For dimensional letter 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, and layout for each sign at least half size.
 - 4. Show locations of electrical service connections.
 - 5. Include diagrams for power, signal, and control wiring.
- 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. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Exposed Accessories: Full-size Sample of each accessory type.
- E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.6 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

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

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Experience with at least five (5) projects of similar size and scale.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 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. 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 fabricated channel dimensional characters, allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg. F, ambient; 180 deg. F, material surfaces.
- 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.

2.2 DIMENSIONAL CHARACTERS

- A. Cast Characters: See drawing for exterior signage. Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
 - 1. Recycled Content: 100% pre-consumer recycled content.
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide the basis of design or comparable product by one of the following:
 - a. A. R. K. Ramos Signage Systems. (BASIS OF DESIGN)
 - b. ASI Sign Systems, Inc.
 - c. Gemini Incorporated.
 - 3. Character Material: Cast aluminum.
 - 4. Character Height: As indicated on drawing.
 - 5. Thickness: Manufacturer's standard for size of character.
 - 6. Finishes:
 - a. Integral Aluminum Finish: Clear anodized.
 - 7. Mounting: Projecting studs.
 - 8. Typeface: Helvetica
- B. Fabricated Channel Characters: See drawings for fabricated channel letters: 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. Basis-of-Design Product: Subject to compliance with requirements, provide the basis of design product or comparable product by one of the following:
 - a. A. R. K. Ramos Signage Systems. (BASIS OF DESIGN)
 - b. ASI Sign Systems, Inc.
 - c. Gemini Incorporated.
 - 2. Illuminated Characters: Backlighting character construction LED lighting including transformers, insulators, and other accessories for operability, with provision for servicing and concealing connections to building electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from character surfaces as needed to illuminate evenly.

- a. Power: As indicated on electrical Drawings.
 - b. Weeps: Provide weep holes to drain water at lowest part of exterior characters. Equip weeps with permanent baffles to block light leakage without inhibiting drainage.
3. Character Material: Sheet or plate aluminum.
 4. Material Thickness: Manufacturer's standard for size and design of character.
 5. Character Height: As indicated.
 6. Character Depth: 2" at the site sign, 3" at the main entrance canopy.
7. Finishes:
 - a. Integral Aluminum Finish: Clear anodized at the main entrance canopy, Anodized dark bronze at the site sign.
 8. Mounting: Manufacturer's standard for size and design of character.
 - a. Hold characters at manufacturer's recommended distance, to be coordinated with architect, from wall surface.
 9. Typeface: Times Roman. (Submit for final approval prior to fabrication)

2.3 DIMENSIONAL CHARACTER MATERIALS

- A. Aluminum Castings: ASTM B 26, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.
- B. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Aluminum Extrusions: ASTM B 221, 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 signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Sign Mounting Fasteners:
 - a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

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.
 - 7. 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. Clear 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. Verify that electrical service is 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. 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. Projecting 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 spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate and install washers and nuts on stud ends projecting through opposite side of surface and tighten.

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 10 14 19

SECTION 10 21 00 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Solid plastic toilet compartments including the following: (Hiny Hiders)
 - 1. Floor mounted overhead-braced toilet compartments.
 - 2. Privacy screens.
- B. Location: Refer to drawings.

1.2 RELATED SECTIONS

- A. Section 05 50 00 - Metal Fabrications.
- B. Section 06 10 00 - Rough Carpentry.

1.3 REFERENCES

- A. ASTM A 666 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- B. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- C. National Fire Protection Association (NFPA) 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
- D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. United States EPA (Environmental Protection Agency) Registration - Bactericidal Surfaces Registered with the U.S. EPA to Legally Make Claims that these Materials Kill Infectious Bacteria.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- 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. Shop Drawings: Provide layout drawings and installation details with location and type of hardware required.
- D. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.
- E. Sustainable Design Submittals:
 - 1. Recycled Content: Certify percentages of post-consumer and pre-consumer recycled content.
 - 2. Regional Materials: Certify distance between manufacturer and Project.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.
- B. Installer Qualifications: A company regularly engaged in installation of products specified in this Section, with a minimum of 5 years experience.
- C. Materials: Doors, panels and pilasters, constructed from high density polyethylene (HDPE) resins. Partitions to be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments. Cover all plastic components with a protective plastic masking.
- D. Performance Requirements:
 - 1. Fire Resistance: Partition materials shall comply with the following requirements, when tested in accordance with ASTM E 84:
 - a. Class A flame spread/smoke developed rating.
 - 2. Material Fire Ratings:
 - a. National Fire Protection Association (NFPA) 286: Pass.
 - b. International Code Council (ICC): Class B.
 - 3. Antimicrobial Touch Surfaces: Hardware touch surfaces shall be manufactured from substrates that are registered with the U.S. EPA to kill specific bacteria tested according to U.S. EPA protocols.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.7 PROJECT CONDITIONS

- 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 absolute limits.

1.8 WARRANTY

- A. Manufacturer guarantees its plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge. Labor not included in warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Scranton Products, which is located at: 801 E. Corey St.; Scranton, PA 18505; ASD Toll Free Tel: 800-445-5148; Fax: 855-376-6161; Email: request info (info@scrantonproducts.com) Web: <https://www.scrantonproducts.com>
 - 1. Fabricator: Santana Toilet Partitions.
 - 2. Fabricator: Comtec Toilet Partitions.
 - 3. Fabricator: Capitol Toilet Partitions.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 MATERIAL

- A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface.
- B. Zinc Aluminum Magnesium and Copper Alloy (Zamac): ASTM B 86.
- C. Stainless Steel Castings: ASTM A167, Type 304.
- D. Aluminum: ASTM 6463-T5 alloy.

2.3 SOLID PLASTIC TOILET COMPARTMENTS

- A. Basis of Design: Hiny Hiders Toilet Partitions as manufactured by and supplied by Scranton Products.
 - 1. Style: Floor mounted overhead-braced toilet compartments.

- B. Doors, Panels, and Pilasters: 1 inch thick with all edges rounded to a radius. Mount doors and dividing panels based on height of specified system.
 - 1. Door and Panel Height: 66 inches.
 - 2. Aluminum heat sink fastened to bottom edges.
 - 3. Panel Edge: Shiplap.
 - 4. Pilasters: 82 inches high and fastened to floor.
- C. Panel Color: As listed at the Finish Legend.
- D. Pilaster Shoes: 3 inches, 20 gauge stainless steel. Secured to pilasters with a stainless steel tamper resistant Torx head sex bolt.
- E. Pilaster Shoes: 3 inches high one-piece molded HDPE. Secured to pilasters with a stainless steel tamper resistant Torx head sex bolt.
 - 1. Pilaster Plastic Shoe Color: Black.
 - 2. Pilaster Plastic Shoe Color: Grey.
 - 3. Pilaster Plastic Shoe Color: Linen.
- F. Headrail: Heavy-duty extruded 6463-T5 alloy aluminum with anti-grip design. Finish to be clear anodized. Fastened to headrail brackets with stainless steel tamper resistant Torx head sex bolt, and fastened at the top of the pilaster with stainless steel tamper resistant Torx head screws.
 - 1. Headrail Brackets: 20 gauge stainless steel with satin finish. Secured to the wall with stainless steel tamper resistant Torx head screws.
- G. Wall Brackets:
 - 1. Aluminum Brackets: Heavy-duty aluminum 6463-T5 alloy.
 - 2. Brackets are fastened to pilasters with stainless steel tamper resistant Torx head screws and fastened to the panels with stainless steel tamper resistant Torx head sex bolts.
 - 3. Bracket Type: Stirrup single ear aluminum.
 - 4. Bracket Type: Continuous 54 inches aluminum.
 - 5. Bracket Type: Continuous 68 inches aluminum.
- H. Door Hardware:
 - 1. Integral Hinges - Stealth: Fabricated in mount on inside of the toilet compartment on the door and pilaster. The door and pilaster is not to have exposed metal parts on the outside of the toilet compartment. Hinges operate with field adjustable nylon cams. Cams can be field adjusted to any degree. The pilaster and doors have to be fabricated to accept the hinge.
 - 2. Door Strike/Keeper: Heavy-duty extruded aluminum 6436-T5 alloy with a bright dip anodized finish. Secured to pilasters with stainless steel tamper resistant Torx head sex bolts. Bumper shall be made of extruded black vinyl.
 - a. Style: 6 inches aluminum.

3. Latch Mechanism: Healthy Hardware Slide Bolt, Pulls and Coat Hook: Made from U.S. EPA registered materials by manufacturer currently holding U.S. EPA Company Number, U.S. EPA Establishment Number and California Broker's License. Satin finish.
4. Latch Mechanism: Aluminum Slide Bolt Latch and Housing: Heavy-duty extruded 6463-T5 alloy aluminum. Latch and housing to have a bright dip anodized finish. Slide bolt and button to have a black anodized finish.
5. Doors supplied with one coat hook/bumper and door pull made of chrome plated Zamak.
6. Equip outswing handicapped doors with second door pull and door stop.

2.4 SOLID PLASTIC PRIVACY SCREENS (PANELASTER)

- A. Provide plastic privacy screens in urinal and entry toilet room applications as indicated or scheduled.
- B. Panels, 1 inch thick with edges rounded to a radius. Screens to be mounted per floor plan. Color as selected by Architect from manufacturer's full line of current colors.
 1. Aluminum heat sink fastened to bottom edges.
- C. Screen Type: Panelaster
 1. Configuration: Wall and floor supported.
 2. Urinal Screens: 18 inches wide by 69" inches high.
 3. Pilaster Shoes: One piece molded HDPE secured to the pilaster with a stainless steel tamper resistant Torx head sex bolt.
 4. Pilaster Shoes Color: Silver; matches clear anodized hardware.
- D. Wall Brackets: Heavy Duty aluminum 6463 – T5 Alloy, Fastened to the panel with stainless steel tamper resistant torx head screws and fastened to wall with stainless steel tamper resistant torx head sex bolts.
 1. Length of Wall Brackets: 55: inches.

PART 3 - EXECUTION

3.1 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.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Examine areas to receive toilet partitions, screens, and shower compartments for correct height and spacing of anchorage/blocking and plumbing fixtures that affect installation of partitions. Report discrepancies to the architect.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install partitions rigid, straight, plumb, and level manor, with plastic laid out as shown on shop drawings.
- C. Clearance at vertical edges of doors shall be uniform top to bottom and shall not exceed 3/8 inch.
- D. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.
- E. Finished surfaces shall be cleaned after installation and be left free of imperfections.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 10 21 00

SECTION 10 23 10 - GLAZED INTERIOR WALL AND DOOR ASSEMBLIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Frameless glazed interior wall and door assemblies.

1.2 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware.

1.3 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2013.
- C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- E. ASTM C1036 - Standard Specification for Flat Glass; 2011e1.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- G. WDMA I.S.1-A - Architectural Wood Flush Doors; Window and Door Manufacturers Association; 2011.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
 - 1. Require attendance by representatives of installer, other entities directly affecting, or affected by, construction activities of this section.
 - 2. Notify Architect four calendar days in advance of scheduled meeting date.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Manufacturer's descriptive literature for each component in partition assembly.
 - C. Shop Drawings: Drawings showing layout, dimensions, identification of components, and interface with adjacent construction.
 - 1. Include field measurements of openings.
 - 2. Include Elevations Showing:
 - a. Locations and identification of manufacturer-supplied door hardware and fittings.
 - b. Locations and sizes of cut-outs and drilled holes for other door hardware.
 - 3. Include Details Showing:
 - a. Requirements for support and bracing of overhead track.
 - b. Installation details.
 - c. Appearance of manufacturer-supplied door hardware and fittings.
 - D. Selection Samples: Two sets, representing manufacturer's full range of available metal materials and finishes.
 - E. Verification Samples: Two samples, minimum size 2 by 3 inches (50 by 75 mm), representing actual material and finish of exposed metal.
 - F. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.
 - G. Certificates: Contractor to certify that installer of partition assemblies meets specified qualifications.
 - H. Operation and Maintenance Data: For manufacturer-supplied operating hardware.
 - I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - J. Specimen Warranty.
 - K. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.
- 1.6 QUALITY ASSURANCE
- A. Fabricator Qualifications: Minimum three years of experience designing, assembling, and installing partition assemblies similar to those specified in this section.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Store products in manufacturer's unopened packaging until installation.

1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a one year period after date of Substantial Completion.
- C. Provide five year manufacturer warranty against excessive degradation of metal finishes. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Frameless Glazed Interior Wall and Door Assemblies:
 - 1. Basis of Design: C.R. Laurence Co., Inc; CRL Cascade Series Frameless Glass Wall Office System: www.crl-arch.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 FRAMELESS GLAZED INTERIOR WALL AND DOOR ASSEMBLIES

- A. Frameless Glazed Interior Wall Assembly: Factory fabricated assemblies consisting of full-width and height glass panels fastened with U-channel fittings on top and bottom edge of glass wall.
 - 1. Configuration: As indicated on drawings.
 - 2. U-Channel Fittings: Extruded aluminum, satin anodized finish, dry glazed, and with matching end caps.
 - a. Top channel is 1-1/2 inch high by 1 inch deep.
 - b. Bottom channel is 1 inch high by 1 inch deep.
 - 3. Glass Thickness: 1/2 inch, tempered.
 - 4. Designed to withstand normal operation without damage, racking, sagging, or deflection.
 - 5. Coordinate wall and door assembly preparation and provide hardware as necessary for fully operable installation.
 - 6. Finished metal surfaces protected with strippable film.
 - 7. Factory assembled to greatest extent practical; may be disassembled to accommodate shipping constraints.
- B. Pivoting Glass Doors: Dry glazed patch fittings.
 - 1. Door Configuration: As indicated on drawings.
 - 2. Height: 2 inch.
 - 3. Length: 6-7/16 inch.
 - 4. Cladding Finish: Satin anodized.
 - 5. Glass Thickness: 1/2 inch, tempered.
 - 6. Door Hardware: Patch bottom fitting, brushed stainless steel.
 - 7. Provide accessories as required for complete installation.

8. Basis of Design: C.R. Laurence Co., Inc; CRL Commercial Patch Hardware, Catalog No. PH20ABS (Top), PH10CBS (Bottom): www.crl-arch.com.

C. Other Manufacturers: Not permitted; provide the product identified as "Basis of Design".

2.3 FITTINGS AND HARDWARE

A. Operable Panel Hardware: Coordinate with additional requirements as specified in Section 08 71 00.

B. Door Handle:

1. Basis of Design: Ladder Pulls by C.R. Laurence Co. Inc., 1-800-421-6144
www.crl-arch.com
 - a. Back-to-back
 - b. Straight
 - c. For 3/8 inch to 3/4 inch Thick Tempered Glass.
 - d. Brushed Stainless Steel Finish
 - e. Standard Sizes: 48 inch
 - f. Model #: 48LPBS

2.4 MATERIALS

A. Glass: Flat glass meeting requirements of ASTM C1036, Type I - Transparent Flat Glass, Class 2 - Tinted, Quality Q3, fully tempered in accordance with ASTM C1048, Kind FT, and as follows:

1. Thickness: As indicated.
2. Color: Grey tint; low iron.
3. Prepare glazing panels for indicated fittings and hardware before tempering.
4. Polish edges that will be exposed in finished work to bright flat polish.
5. Temper glass materials horizontally; visible tong marks or tong mark distortions are not permitted.

B. Aluminum Components: Conforming to ASTM B221 (ASTM B221M), Alloy 6063, T5 Temper.

C. Sealant: One-part silicone sealant, conforming to ASTM C920, clear.

2.5 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that track supports are properly braced, level within 1/4 inch (6 mm) of required position and parallel to the floor surface.
- C. Verify floor flatness of 1/8 inch in 10 feet (3 mm in 3 m), non-cumulative.
- D. Do not begin installation until supports and adjacent substrates have been properly prepared.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean substrates thoroughly prior to installation.
- B. Prepare substrates using the methods recommended by the manufacturer for achieving acceptable result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with glazed interior wall and door assembly manufacturer's instructions.
- B. Fit and align glazed interior wall and door assembly level and plumb.

3.4 ADJUSTING

- A. Adjust glazed interior wall and door assembly to operate smoothly from sliding or pivoting positions.
- B. Adjust swing door hardware for smooth operation.

3.5 CLEANING

- A. Clean installed work to like-new condition.
- B. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

3.6 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

- B. Demonstrate operation of glazed interior wall and door assembly and identify potential operational problems.

3.7 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before date of Substantial Completion.

END OF SECTION 10 23 10

SECTION 10 26 00 - 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. Wall Protection.
2. Corner guards.
3. Door frame guards.

B. Related Sections:

1. Section 05 50 00 "Metal Fabrications" for steel angle corner guards.
2. Section 08 71 00 "Door Hardware" for metal armor, kick, mop, and push plates.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide handrails capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform load of 50 lbf/ft. applied in any direction.
2. Concentrated load of 200 lbf applied in any direction.
3. Uniform and concentrated loads need not be assumed to act concurrently.

1.4 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.6 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.
 - 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 and ICC/ANSI A117.1.

1.7 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 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.
 - a. Store corner-guard covers in a vertical position.
 - b. Store wall-guard and handrail covers in a horizontal position.

1.8 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 for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.9 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 and sheet material, thickness as indicated.
 - 1. Impact Resistance: Minimum 25.4 ft-lbf/in. 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. 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 for Alloy 6063-T5.
- D. Stainless-Steel Sheet: ASTM A 240/A 240M.
- E. 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.

- F. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer.
- G. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and that complies with the testing and product requirements of "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 WALL PROTECTION (KITCHEN)

- A. PVC Sheets: Assembly consisting of 4' x 10' semi-rigid PVC sheet.
 - 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. Altro; Puraguard (BOD).
 - b. IPC Door and Wall Protection Systems; Division of InPro Corporation.
 - 2. Cover: 4' high X 10' thick x .08 PVC.
 - 3. Accessories: Provide trim connector accessories.
 - 4. Mounting: Per Manufacturers recommendations (Kitchen).

2.3 CORNER GUARDS

- A. Surface-Mounted, Stainless Steel Corner Guards: Assembly consisting of 3-1/2 x 3-1/2 type 304 alloy with #4 satin finish, 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. IPC Door and Wall Protection Systems; Division of InPro Corporation. (BOD)
 - b. Acrovyn; Division of Construction Specialties.
 - c. Korogard Wall Protection Systems; a division of RJF International Corporation.

2.4 DOOR FRAME GUARDS (KITCHEN)

- A. Surface applied factory formed PETG Polyethylene to be formed and supplied with factory applied double faced tape.
 - 1. Manufacturers:
 - a. Acrovyn; Division of Construction Specialties.
 - b. IPC Door and Wall Protection System; Division of InPro Corporation.

2.5 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.

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. Sheet PVC: Refer to Drawings.
 - b. Corner Guards: Refer to Drawings.
 - c. Dorr Frame Guards: Refer to Drawings.

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, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches.
 - c. Adjust end and 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 10 26 00

SECTION 10 28 00 - TOILET, BATH, 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. This Section includes the following:
 - 1. Public-use washroom accessories.

1.3 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. Manufacturer's warranty.
- B. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated on Drawings.
 - 2. Identify products using designations indicated on Drawings.
- D. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.
- E. MSDS: Provide material safety data sheets.

1.4 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.

1.5 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.
- C. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- E. 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.

2.2 PUBLIC AND PRIVATE USE WASHROOM ACCESSORIES

- A. Refer to drawings for quantity and location of items.
- B. 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:
- C. Basis-of-Design Product: The design for accessories is based on products indicated. All products are required under University Standards.
 - 1. Bradley Corp. (Refer to Drawings).
- D. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Bradley Corp.
 - 2. American Specialties Inc.
 - 3. Bobrick Washroom Equipment, Inc.

2.3 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.

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, when tested according to method in 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 10 28 00

SECTION 10 44 13 - FIRE EXTINGUISHER 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 Sections:
 - 1. Division 10 Section "Fire Extinguishers."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
 - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Size: 6 by 6 inches square.
- C. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
 - 1. Sheet: ASTM B 209.
- B. Accepted Recycled Content for Aluminum: Provide products with postconsumer plus one-half of preconsumer recycled not less than sixty percent (60%).

2.2 FIRE PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Larsen's Manufacturing Company; Cabinet #FS-AL2409-5R (Fire Rated Cabinet).
 - b. JL Industries
- B. Cabinet Construction: To meet fire rating of wall. (1 Hour)
- C. Cabinet Material: Steel sheet.
- D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.
 - 1. Rolled-Edge Trim: 1-1/2-inch backbend depth.
- E. Cabinet Trim Material: Aluminum
- F. Door Material: Aluminum
- G. Door Style: Vertical Duo. (Basis of Design)
- H. Door Glazing: Acrylic sheet
 - 1. Acrylic Sheet Color: Clear transparent acrylic sheet.
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide recessed lever handle with cam-action latch.
 - 2. Provide manufacturer's standard hinge.
- J. Accessories:
 - 1. Lettering on Metal Doors: Black, vertical.
 - 2. Door Lock: Cylinder lock, keyed alike to other cabinets. Larsen Loc.

K. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:
 - a. Exterior of cabinet except for those surfaces indicated to receive another finish.
 - b. Interior of cabinet.
 - c. Door and Trim: Clear Satin Anodized Finish.

2.3 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 selected.
 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

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. 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.

2.5 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.6 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning" or SSPC-SP 8, "Pickling". After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed fire extinguisher cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for semirecessed 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.
- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire protection cabinets.

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 manufacturers 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 10 44 13

SECTION 10 44 16 - 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 Sections:
 - 1. Division 10 Section "Fire Extinguisher Cabinets."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.
- C. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.
- D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- 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 FMG.

1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that, fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 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, provide products by the following:
 - a. Larsen's Manufacturing Company – MP-5.
 - b. JL Industries
 - 2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.2 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. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Larsen's Manufacturing Company.
- 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: As mounted on drawing A.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 44 16

SECTION 10 51 13 - METAL LOCKERS (*OPTION 2*)

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. Heavy duty, welded metal lockers.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.
- B. Shop Drawings: For metal lockers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locker trim and accessories.
 - 2. Include locker identification system and numbering sequence.
- C. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.
- D. Warranty: Sample of special warranty.
- E. MSDS: Provide material safety data sheets.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Regulatory Requirements: Where metal lockers are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities".

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.
- B. Deliver combination control chart to Owner by registered mail or overnight package service.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate sizes and locations of concrete bases for metal lockers, as shown on drawing.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period for Heavy-Duty Metal Lockers: Two years from date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Full-size units of the following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:
 - a. Locks
 - b. Identification plates
 - c. Hooks

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 zinc-iron, alloy (galvannealed) coating designation.
- C. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- D. Anchors: Material, type, and size required for secure anchorage to each substrate.
 - 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
 - 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.2 STANDARD METAL LOCKERS

- A. Products: Subject to compliance with requirements, provide the following:
 - 1. Republic Storage Systems Company.
 - 2. Penco Products, Inc. Heavy Duty Double Tier
 - 3. Art Metal Products.
- B. Locker Arrangement:
 - 1. Team Rooms (18 x 18 Single Tier)
 - 2. P.E. Lockers (12 x 18 Four-Tier)
 - 3. MVP Lockers with locked compartment.
- C. Material: Cold-rolled steel sheet.
- D. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet as follows:
 - 1. Tops, Bottoms, and Intermediate Dividers: 24 gauge, with single bend at sides.
 - 2. Backs and Sides: 24 gauge, with full-height, double-flanged connections.
 - 3. Shelves: 24 gauge, with double bend at front and single bend at sides and back.
- E. Frames: Channel formed; fabricated from 16 gauge steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.

1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
- F. Doors: One piece; fabricated from 14 gauge steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
 2. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.048-inch nominal-thickness steel sheet; welded to inner face of doors.
 3. Door Style:
 - a. Flush design without louvers or perforations.
- G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees; self-closing.
1. Knuckle Hinges: Steel, full loop, five knuckle, tight pin; minimum 2 inches high. Provide no fewer than three hinges for each door more than 42 inches high.
- H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond face of door; pry and vandal resistant.
1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in key locks, or padlocks; positive automatic latching and prelocking.
 - a. Latch Hooks: Equip doors less than 48 inches high with two latch hooks; fabricated from 0.105-inch nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
- I. Built-in Combination Locks: Key-controlled, three-number dialing combination locks; capable of at least five combination changes made automatically with a control key.
1. Bolt Operation: Manually locking deadbolt or automatically locking spring bolt.
- J. Equipment: Equip each metal locker with identification plate and the following unless otherwise indicated:
1. One double-prong back hook and two single-prong wall hooks.
- K. Accessories:
1. Continuous metal Zee Base.
 2. Continuous Sloping Tops: Fabricated from manufacturer's standard thickness, but not less than 0.036-inch nominal-thickness steel sheet.
 - a. Closures: Vertical -end type.

3. Filler Panels: Fabricated from manufacturer's standard thickness, but not less than 0.036-inch nominal-thickness steel sheet.

L. Finish: Powder coat.

1. Color(s): Refer to Finish Schedule.

2.3 FABRICATION

A. Fabricate metal lockers square, rigid, and without warp and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. Heavy-duty welded construction.

D. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.
3. Provide 5% quantity per code – submit with shop drawings.

E. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

F. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.

G. Continuous Base: Metal Zee Base by locker manufacturer.

H. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

I. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

2.4 STEEL SHEET FINISHES

A. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard, baked-polymer, thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

2.5 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install level, plumb, and true; shim as required, using concealed shims.
 - 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 - 2. Anchor single rows of metal lockers to walls near top and bottom of lockers.
- B. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 1. Attach hooks with at least two fasteners.
 - 2. Attach door locks on doors using security-type fasteners.
 - 3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
 - b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.
 - 4. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
 - 5. Attach sloping-top units to metal lockers, with closures at exposed ends.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.
- B. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- C. Touch up marred finishes or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 13

SECTION 10 51 16 - LOCKERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Lockers
- B. Locker benches

1.2 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry.

1.3 REFERENCES

- A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- 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. Shop Drawings: Drawings shall be submitted showing individual locker size and overall dimensions.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 3 inches square representing actual product, color, and patterns.
- F. Sustainable Design Submittals:
 - 1. Recycled Content: Certify percentages of post-consumer and pre-consumer recycled content.
 - 2. Regional Materials: Certify distance between manufacturer and Project and between manufacturer and extraction or harvest point in miles.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.
- B. Installer Qualifications: A company regularly engaged in installation of products specified in this Section, with a minimum of 5 years' experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Locker components shall be stored flat until assembly. All finishes shall be protected from soiling and damage during handling.

1.7 PROJECT CONDITIONS

- 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 recommended limits.

1.8 WARRANTY

- A. Warranty: Manufacturer guarantees its plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge. (Labor not included in warranty.)
- B. Warranty: Manufacturer guarantees its plastic against breakage, corrosion, and delamination under normal conditions for 15 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge. (Labor not included in warranty.)

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Scranton Products, which is located at: 801 E. Corey St.; Scranton, PA 18507; Toll Free Tel: 800-445-5148; Fax: 800-551-6993; Email: request info (info@scrantonproducts.com); Web: www.scrantonproducts.com
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 LOCKERS

- A. Design: Double Tier Tufftec locker.
 - 1. Product: Tufftec Solid Plastic Locker. (Class A rated)
 - 2. Lockable vented storage with lockable lift-up lid and open storage compartments as indicated on drawings.
 - 3. Hanging storage with 4-hanging storage hooks.
- B. Design: Athletic locker.
 - 1. Vertical Stack: Refer to Room finish Schedule.
- C. Size: Individual and stack height as indicated on drawings.
 - 1. Locker Depth: Refer to Room finish Schedule.
 - 2. Locker Width: Refer to Room finish Schedule.
- D. Hardware:
 - 1. Padlock hasp.
 - 2. One top-mounted, two-pronged plastic coat hook (1, 2 and 3 tier only).
 - 3. Horizontal venting.
 - 4. Continuous hinge.
 - 5. Continuous security latch.
 - 6. Lattice venting (full and horizontal).
 - 7. Slope top.
 - 8. Combination padlock. ADA compliant
- E. Base: Concrete base with tile finish.

2.3 CONSTRUCTION

- A. Locker doors and frames shall be made from high impact, high density polyethylene (HDPE) formed under high pressure into solid plastic components 1/2 inch thick with homogeneous color throughout.
- B. Sides, tops, bottoms, backs, and shelves shall be made from high impact, high density, polyethylene (HDPE) formed under pressure into solid plastic components 3/8 inch thick with homogenous natural color throughout. Out sides, insides, tops, bottoms, backs, dividers and shelves shall be natural in color.
- C. Provide end panels and filler panels of plastic material in color of locker unless noted otherwise as an accent color.
- D. Continuous latch shall be made from high impact HDPE plastic and capable of accepting various locking mechanisms. The spring-loaded latch shall be securely fastened to the entire length of the door providing a quiet positive latching function.

- E. Door hinge shall be made from heavy duty extruded aluminum with a powder coating in black or silver. Door hinge shall be full length assembled onto the door and front.
- F. Door hinge shall be made from heavy duty zinc-plated steel, full length, assembled onto door and locker front.
- G. Assembly profile shall be full height of the lockers. Profile shall be made from PVC plastic and snapfit assemble onto locker sides.
- H. Assembly profile shall be full height of the lockers. Profile shall be Tongue-and-groove joint construction using 3/8 inch thick HDPE.
- I. Coat hooks shall be two-prong and made from high impact plastic. Hooks shall be mounted to bottom of the shelf or divider, one each per door opening. (Standard on Single, Double and Triple tier lockers only).

2.4 MATERIALS

- A. Lockers shall be constructed from High Density Polyethylene (HDPE) resins. Material shall be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments.
- B. Plastic components shall resist deterioration and discoloration when subjected to any of the following: acetic acid 80%, acetone, ammonia 12%, ammonium phosphate, bleach 12%, borax, brine, caustic soda, chlorine water, citric acid, copper chloride, core oils, hydrochloric acid 40%, hydrogen peroxide 30%, isopropyl alcohol, lactic acid 25%, lime sulfur, nicotine, potassium bromide; soaps, sodium bicarbonate, trisodium phosphate, urea, urine and vinegar. (Testing in accordance with corrosion testing procedure established by the United States Plastic Corporation.)
- C. HDPE components shall have a smooth "orange peel" finish. Locker doors and door frames shall be the same color.
 - 1. Color: As selected from manufacturer's standard colors.

2.5 FABRICATION

- A. Locker components shall be fabricated square and rigid with a finish free of scratches and chips.
- B. Solid plastic locker components shall snap together at profile connections or slide together at dovetail connections for easy assembly and shall provide a solid and secure anti-racking book case component construction for clean lines and precise reveals. Adjacent lockers shall share a common side panel. Locker units shall be manufactured for assembly in a group of no more than three adjacent lockers.

2.6 BENCHES

- A. Bench tops shall be 1-1/2 inches thick with all edges rounded to a 1/4 inch radius. Standard bench top size is 9-1/2 inches wide by length not to exceed 96 inches for one single piece.
- B. Steel pedestals shall be 16-1/4 inches high, secured to bench tops with stainless steel tamper resistant Torx head screws and secured to the floor using lead expansion shields with 2 inches stainless steel Phillips head machine bolts.
- C. Aluminum pedestals shall be 16 inches high, and secured to bench tops with stainless steel tamper resistant Torx head screws and secured to the floor using lead expansion shields with 2 inches stainless steel Phillips head machine bolts
- D. Bench Top Color: As selected from manufacturers' standard colors. See Finish Schedule.

PART 3 - EXECUTION

3.1 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.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Report discrepancies to the architect.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install lockers at the location shown in accordance with the manufacturers' instructions for plumb, level, rigid and flush installations.
- C. Anchor the units to the wall studs through the locker back and to the floor using 1-1/2 inches tapcon screws.
- D. Lockers shall be floor-mounted as scheduled or indicated. Floor shall be level for proper installation.
- E. Lockers shall be installed on a 4 inch high base as scheduled or indicated. Base shall be level for proper installation.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 10 51 16

SECTION 11 11 26 - HEAVY DUTY SCHOOL BUS FRESH WATER WASH SYSTEM

PART 1 - GENERAL

1.1 GENERAL

- A. The work of this section shall include furnishing all labor, materials, equipment, and accessories necessary to install and commission a completely automatic, touchless heavy-duty vehicle wash system to wash front, roof, rear, both sides and chassis for all types of street legal vehicles used by fleet owner. The size, quantities, and locations shall be as shown on the project drawings.

- 1.2 The Manufacturer is responsible for the supply of necessary equipment, materials and service for the complete assembly and erection of the equipment so that it is ready for operation as per these specifications.

1.3 Related Sections

1. Section 01 33 00 – Submittal Procedures
2. Section 01 43 00 – Quality Assurance
3. Section 01 65 00 – Product Delivery Requirements
4. Section 01 66 00 – Product Storage and Handling Requirements
5. Section 01 71 00 – Execution and Close-Out Requirements
6. Section 01 78 00 – Close-Out Submittals
7. Section 22 05 00 – Common Work Results for Plumbing
8. Section 26 05 00 – Common Work Results for Electrical

1.4 REFERENCES

The reference publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by basis designation only.

A. ASTM International

1. ASTM A36/A36M – Standard Specification for Carbon Structural Steel
2. ASTM A123/A123M – Standard Specification for Zinc Coating (Hot-Dip Galvanized)

B. American Welding Society (AWS)

1. AWS D1.1/D1.1 M - Structural Welding Code - Steel

C. National Electric Manufacturer's Association (NEMA)

1. ANSI/NEMA 250 – Enclosures for Electrical Equipment

- D. National Electric Code (NEC)
 - 1. ANSI/NFPA 70, Article 430 - Motors, Motor Circuits, and Controllers
 - 2. ANSI/NFPA 79 – Electrical Standard for Industrial Machinery
- E. Underwriters Laboratory (UL)
 - 1. UL 508A – Industrial Control Panels

1.5 SUBMITTALS

A. Product Data

- 1. Submit Product Data in accordance with project specifications. Restrict submitted material to pertinent data.
 - a. Include rated capacities, operating characteristics, electrical and mechanical characteristics for furnished components, assemblies and accessories used to produce the work of this section.
 - b. All Product Data submittals shall identify proposed project specific items, parts, and accessories clearly marked and discernable to the reviewer. Non-marked or generic product data submittals with no marks indicating items, parts or accessories will be cause for rejection.
- 2. Submit statements of compliance and supporting documents for the following:
 - a. Signed statement by manufacturer that the product(s) comply with all requirements as specified.
 - b. Vendor’s certification stating compliance with ASTM 123 for zinc coating (hot-dipped galvanized) of steel.

B. Shop Drawing Submittals

- 1. Submit Shop Drawings in accordance with project specifications. Restrict submitted material to pertinent data related to each element of the work of this section.
 - a. Shop drawings shall provide plan-view layout and overall dimensions of each major component or assembly of the wash system, including utility connections.
 - b. Include detailed equipment assemblies indicating dimensions, required clearances, components and location and size of each field connection.
 - c. Include Bill-of-Material (BOM) for assemblies which make-up wash system.
- 2. Submit wiring diagrams for power, signals, and controls.

C. Commissioning and Field Test Report

- 1. Manufacturer shall submit final test report and applicable test data within ten (10) business days from completion of successful testing and commissioning of wash system. Comply with project specifications Div. 01 General Requirements as applicable.

D. Performance Submittals

1. Statements and documentation of experience per requirements of Section 1.5 Quality Assurance for Manufacturer and Installer.

1.6 QUALITY ASSURANCE

- A. Provide the wash system as a complete unit including controls and accessories produced or supplied by a single manufacturer.
- B. Test the assemblies and subassemblies, when practical, for proper operation prior to shipment.
- C. The Manufacturer must be a legal, U.S. based entity with not less than five (5) years of continuous product manufacturing of the same model submitted without deviation.
- D. Manufacturer shall provide a technical representative to supervise work related to equipment installation, start-up, commissioning, and training.
- E. If installation is performed by an independent Installer, the Manufacturer shall provide a letter stating installer is authorized and properly trained in the installation, adjustment, and operation of equipment.
- F. Provide UL listing card or equivalent document of a Nationally Recognized Testing Laboratory (NRTL) from the company building the control panel(s) certifying that the panel(s) have been built to the electrical standards referenced in Section 1.3 of this specification.
- G. No deviations from these specifications will be allowed unless approved by Owner in writing prior to bid closing. All equipment and equipment functions must be built and designed to these specifications. Regardless of the owner's approval of any deviations and/or changes, the Manufacturer is solely responsible for the performance of the supplied equipment.

1.7 PRE-INSTALLATION COORDINATION

- A. Refer to project specifications for Project Management and Coordination specifications.
 1. Manufacturer to participate in any scheduled virtual, or if required, on-site meeting prior to the start of construction to discuss schedule, responsibilities, critical path items, and approvals. Participants include Manufacturer's Employee, Installer, Engineer, Architect, Contractor, all relevant trades, or others responsible for wash system installation and coordination.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Package wash components for shipment by the Manufacturer and protect by means and methods suitable for the intended shipping and storage environments. Comply with Product Delivery Requirements of these specifications.
- B. General Contractor shall provide forklift and lifting provisions for material handling.

- C. Label crates and containers and provide shipping documentation identifying content.
- D. Stored equipment shall be protected from weather, excessive humidity, excessive temperature variation, dust, dirt, or other contaminants. Comply with Product Storage and Handling Requirements of these specifications.
 - 1. Store all electrical equipment in an indoor, temperature-controlled location free from rodent infestation that might cause damage to electrical components.
 - 2. Store mechanical components in a covered and secured location.
 - 3. Do not store equipment directly on the ground and protect from standing water or environmental conditions that may cause rust and corrosion.
 - 4. Store equipment in an area that is not subject to damage from construction activities.

1.9 EQUIPMENT WARRANTY

- A. Manufacturer shall warrant the Product(s) against defects in material, workmanship, design and manufacturing for a period of one (1) year from the date of shipment from the factory, subject to Manufacturer terms and conditions in effect at the time of shipment.
- B. The Manufacturer shall repair or replace, at Manufacturer's sole discretion, any defective Product(s) provided that:
 - 1. Customer gives manufacturer written notice or submits Warranty Claims Request.
 - 2. The Product(s) was installed by the Manufacturer or approved installer.
 - 3. The Product(s) have not been altered or modified, subject to improper storage, misuse, improper maintenance, negligence, improper installation, or repaired with parts not authorized by Manufacturer.
 - 4. Maintenance reports documenting adherence to Manufacturer's preventative maintenance requirements from date of delivery to date of warranty claim.
- C. The warranty does not cover, and may not be limited to, damage due to abuse, misuse, natural disasters, damage in storage, excessive vehicle speed, temperature extremes, long-term flooding or lack of proper drainage, buildup of debris, improper electrical power feed voltage or frequency, or damage sustained by vehicle impact.

PART 2 - PRODUCTS

2.1 MANUFACTURER AND MODEL

- A. Basis of Design shall be model LYUS-FT1 heavy-duty spinner wash with one-step detergent application as manufactured by:

1. InterClean Equipment
709 James L. Hart Parkway
Ypsilanti, Michigan 48197
734-961-3300
www.interclean.com
Office: 734-961-3300
sales@interclean.com
2. Alternate Manufacturer/Approved Equal requests: Requests for approved equal must be submitted in writing to the Architect/Design Engineer/Contracting Officer no less than 10 calendar days prior to the bid or proposal due date. Submittal must contain the following:
 - a. Submit a detailed, written Comply, Deviate, Exception (C, D, and E) analysis for each specification line item of the proposed alternate wash system versus the specified wash system.
 - b. Provide documentation as appropriate to support C, D, and E analysis.
 - c. Provide a complete list of touchless heavy-duty vehicle wash system installations for the last five (5) years listing duration of service, and application. Include the name and contact information of a person who is familiar with the wash system at that location. Based on information supplied and discussions with contact person, the Engineer will determine acceptability of the proposed Manufacturer and equipment.
3. Compliance with the specified wash system function, operation, and performance are mandatory. Deviations are not allowed.
4. Additional costs resulting from substitutions of products other than specified, including drawing changes and construction, shall be at the General Contractor's expense.

2.2 WASH SYSTEM PERFORMANCE PARAMETERS

- A. The Manufacturer is solely responsible for the equipment's performance. Should the equipment not perform, as per these specifications, the Manufacturer shall modify, add or alter the equipment supplied at the Manufacturer's expense until the performance is satisfactory.
- B. The vehicle wash system shall be sequentially actuated by vehicles driven in a fixed path between tire guides at a slow speed (50-60 feet/ minute) through the wash system. All washing operations and related water recycling operations shall be automatic.
- C. The wash system shall satisfactorily wash up to 30 vehicles per hour. The vehicle wash shall remove most visible heavy dirt accumulation and road film from the owner's vehicles when driven through the washer at the stated speed. The evaluation of the system's ability to remove road film shall be determined only after the vehicles have dried after the washing has been completed.
 1. The cleaning performance shall match and/or exceed those standards that are prevailing in the touchless retail car wash industry.
 2. The amount of detergent used per vehicle to remove road film shall not exceed 0.4 gallons.

3. No acids containing fluorides (HF or ABF) shall be allowed.

D. The vehicle wash system to be capable of washing all vehicles up to 14' in height including the following:

1. Cars, Pick-up, Vans
2. Dump trucks, Solid waste trucks, and all street-legal Public Works vehicles
3. Utility trucks with attached ladders or other equipment
4. Buses and School buses

2.3 FINISH

A. All major steel components in wash bay, unless otherwise listed, shall be hot dip galvanized per ASTM A123. Coatings which utilize zinc rich primers or other anti-corrosive treatments are not acceptable.

2.4 WASH SYSTEM TECHNICAL SPECIFICATIONS

A. High-Pressure Spinners

1. High-pressure spinners to be Centri-Spinner, Spraying Systems spinner, or engineer approved equal. All spinners submitted for approval must have been tested and passed a 5,000-hour continuous run test without failure.
2. Each spinner shall use four (4) fully adjustable zero-degree nozzles as manufactured by Spraying Systems.
 - a. Attach zero-degree nozzles using field-adjustable position elbows to allow spray cone diameter changes. Spinners without adjustment are not acceptable to Owner.
 - b. Each nozzle shall have secondary air jet nozzle attached. Each air jet nozzle is 3 inches long with six (6) air intake ports at the interface between the two nozzles. Spinner without air jet nozzles are not acceptable to Owner.
 - c. Zero degree and air jet nozzles must be made of stainless steel.
 - d. Provide spinner adjustment tool to allow repeatable field adjustment of elbow angles of all nozzles without removing spinners from the arch. Optimal nozzle angle shall be determined by the Manufacturer.
 - e. Water inlet connections for each spinner must be stainless steel and be minimum 1 inch in diameter for maximum flow and pressure. Inlet connections smaller than 1 inch are not acceptable to Owner.
3. Rotational speed of spinners shall be adjustable from 90 to 400 rpm by adjusting the internal oil pump.
 - a. Spinner without speed adjustment, or with free-floating oil pump gears without center shafts are not acceptable to Owner.

4. Spinner assembly shall require no periodic maintenance or lubrication.
5. Internal high-pressure seal shall be mechanical.

B. Chemical Arch

1. Operation and position of arch shall be determined by Manufacturer to provide optimum detergent coverage.
2. Provide one (1) arch for high pH detergent.
3. Provide two (2) Dosatron detergent proportioners with adjustable injection stem for arch to provide detergent dilution range from 1:200 (0.5%) to 1:20 (5%).
 - a. Alternate proportioners include Inject-o-Meter or engineer approved equal. Injectors must be positive displacement type.
4. Fabricate arches with 1.25-inch diameter stainless steel pipe with stainless arch supports fastened to floor. Equip arch with twenty-five (25) double swivel nozzles with check valves for even detergent application on front, rear, sides, and roof of vehicle driving under arch.
 - a. Design arch to immediately activate detergent application when vehicle position is detected.
 - b. Stainless is required. No substitutions allowed. Supply piping to arch may be stainless steel or PVC.
5. The detergent application arch shall include a separate 1-inch stainless steel intensified rear detergent manifold with 7 spray nozzles controlled by a dedicated Dosatron proportioner, solenoid control valve, and vehicle sensing device.
 - a. Detergent application and concentration to rear of vehicle shall be independently adjustable.
 - b. Activate intensified detergent arch immediately after vehicle has passed under primary chemical arch.
 - c. Oscillating arches are not acceptable to the Owner.
6. Activate all arches with photo eyes mounted on adjustable height stands designed to activate with all vehicle sizes. Wire sensors to watertight junction boxes with drain holes.
7. Furnish 3 HP water booster pump for consistent water pressure to detergent proportioners.
8. Provide twin tank, alternating and metered water softener. Alternate regeneration tanks to allow continuous supply of softened water from one tank while the second tank is regenerated. shall produce water quality that will increase the efficacy of the detergent and reduce detergent consumption.
 - a. Water softening system shall reduce the hardness to less than 3 grains of hardness to increase the efficacy of the detergent and reduce detergent consumption.
 - b. System design shall be based upon the hardness test of water supply. If the domestic water supply is less than 3 grains hardness, supplier shall provide Owner test results proving the water hardness is acceptable without use of a water softener.

- c. Size water softener to meet or exceed water demand for detergent arch.
 - 9. Provide 199,000 BTU natural gas water heater to heat softened water feeding detergent arch.
 - a. If natural gas is not available, provide industrial grade electric water heater sized to meet demand when factoring heater recovery rate.
- C. High Pressure Spinner Arch
 - 1. Provide high-pressure arch with twelve (12) rotating spinners mounted on one common self-supporting arch assembly for cleaning of all shape and size vehicles including wheels and wheel wells.
 - a. High-pressure arch shall be made of 2-inch schedule 40 galvanized pipe.
 - b. Spinners must be adjustable vertically and horizontally relative to the vehicle.
 - c. Oscillating arches are not acceptable to the Owner.
 - 2. Protect three (3) bottom spinners on both sides of arch with spinner protection guards made of two-inch schedule galvanized pipe. Spinner guards will swing aside and protect spinners should the vehicle jump the tire guide. Demonstrate to the Owner the function of the spinner guard system.
- D. Chassis Wash
 - 1. Equip chassis wash with two (2) specified, or Engineer approved, spinners.
 - a. Mount spinners on removable modular skid to facilitate cleaning
 - b. Install protective plate to prevent personnel from accidentally stepping through to center trench under skid.
 - c. Spray bars with fixed nozzles, either stationary or oscillating, are not acceptable to Owner.
- E. Intensified Rear Wash Arch
 - 1. A separate rear wash arch made of 2-inch schedule 40 galvanized pipe with 34 nozzles designed to supply minimum water output of 250 GPM @ 300 PSI.
 - 2. The rear wash arch shall be totally separate and independent from the high-pressure spinner arch. The rear wash arch shall use either rotating spinners or fixed position nozzles positioned for effective rear of vehicle washing. Oscillating Nozzles are not acceptable to the Owner. The Manufacturer is solely responsible for the performance warranty.
 - 3. Intensified rear arch will activate after vehicle passes the spinner arch and shall clean rear of the vehicle only. Arch will automatically shut off after rear of vehicle has passed.
 - a. Manufacturer shall guarantee effective cleaning of the rear of vehicle passing through the wash system at 50 ft/min.
 - 4. Divert high-pressure water to intensified arch by high-speed 3-way coaxial valve as manufactured by Co-ax Valves, Inc.

- a. Valve shall utilize a control tube moving along same axis as fluid flow and shall have adjustable switching time between 150 to 2000 milliseconds.
- b. Valve must be pressure balanced so operation is unaffected by inlet pressure or pressure fluctuations.
- c. Valve shall have a designed cycle life of 500,000 cycles and incorporate wear compensating seals.

F. High-Pressure Pumping Module

- 1. Supply centrifugal diffuser type high-pressure pump, as manufactured by Ebara, capable of producing pressures up to 300 PSI with maximum flow up to 255 GPM.
- 2. Suction, discharge, stage and diffuser casings shall be ductile iron.
- 3. Casing design will permit hydrostatic testing to 150% of maximum pumping pressure at operating speed.
- 4. Bronze impellers shall be suction type and balanced to minimize axial thrust loads. Each impeller shall be individually keyed to pump shaft.
- 5. Bearings must have an average operational life of 50,000 hours. Bearings must be greaseable.
- 6. High-pressure pump shall be driven by a squirrel cage induction motor suitable for across-the-line starting with a minimum rating of 60 HP and include soft start. The motor shall be totally enclosed fan cooled (TEFC) and operate on 460V, 3-phase, 60 hertz with a service factor of 1.15.

G. Tire Guides

- 1. Tire guides shall run full length of wash system on both sides of vehicle.
- 2. Angle tire guide at entrance and cover all ends with round, smooth welded steel caps.
- 3. Fabricate tire guides from 4-inch diameter steel pipe and support with brackets at 5-foot intervals.
 - a. Fabricate brackets with minimum 1/2" steel plate with holes for anchoring.
 - b. Hot dip galvanize all tire guides after fabrication.

H. Water Holding tank

- 1. The system shall be equipped with a 925-gallon polyethylene water holding tank equipped with high and low level float switches.
- 2. The holding tank shall be filled via a 2", slow closing solenoid valve activated by a high-level float switch in the holding tank.

2.5 SYSTEM CONTROLLER AND COMPONENTS

- A. Panels and controls must be built according to these specifications. No substitutions are allowed. The control system shall be PLC based with separate HMI and must be designed by the Manufacturer.

- B. The PLC shall be the centralized process application controller and provide near real time control of the entire wash system and integration with other systems
 - 1. Connect PLC to a distributed I/O via an Ethernet network. The operator interface shall be through a separate HMI, not integral to the PLC, and connected to the PLC via Ethernet. Provide I/O capacity for future expansion.
 - 2. Provide terminal windows for monitoring and troubleshooting communication problems with any devices communicating to PC via Ethernet, RS232, etc.
 - 3. Initialize all devices to a known state at start-up. Store all configurable settings such as timing set points, alarm settings, and communication settings in PLC and removable storage device. Alarms must have user configurable delays to prevent nuisance tripping.
 - 4. System settings such as baud rates, parity, comport configurations must be reconfigurable without need to recompile application software.
 - 5. Failure of any components shall disable the entire wash system.

- C. The primary control panel and all sub panels shall be manufactured and evaluated to Underwriters Laboratories, Inc. (UL) standard 508A -Industrial Control Panels. Panels shall be evaluated for short circuit withstand capacity and shall bear the appropriate UL marks including the short circuit withstand value mark as part of the official UL label.
 - 1. All panels must be designed for 460 V, 3 phase, 60 Hertz with a short circuit capacity of 10,000 amperes RMS symmetrical at incoming line terminals of control panel.
 - 2. Panel must be designed to meet the requirements of NEC ANSI/NFPA 70, Article 430 and ANSI/NFPA 79 – Electrical Standard for Industrial Machinery.
 - 3. Control panels that are not UL approved and labeled are not acceptable to the Owner with no exceptions.

- D. Mount PLC and HMI in NEMA 4 rated electrical enclosure.

PART 3 - EXECUTION

3.1 MECHANICAL INTERCONNECTING PIPING

- A. All field plumbing and mechanical work will be done by the Mechanical Contractor contracted by General Contractor, including:
 - 1. Water and gas utilities up to and including connection to the equipment.
 - 2. Interconnecting piping between various equipment components located in the equipment room.
 - 3. Interconnecting piping, above ground or under slab, between the equipment located in the equipment room and the equipment located in the wash bay.
 - 4. Furnish and install backflow preventer if required.
 - 5. Duct and roof penetration for natural gas water heater if required.

3.2 ELECTRICAL INTERCONNECTING WIRING

- A. All field electrical work will be done by the Electrical Contractor contracted by General Contractor, including:
 - 1. Electrical service up to and including connection to the equipment panel.
 - 2. Interconnecting conduits and wiring between various equipment components located in the equipment room.
 - 3. Interconnecting conduit and wiring, above ground or under slab, between the equipment located in the equipment room and the equipment located in the wash bay.

3.3 EXAMINATION

- A. Contractor/Installer shall document site conditions that significantly differ from design drawings that may negatively impact performance of wash system to be installed.
- B. Provide system specification or functional requirements to support the need for correcting deviation(s).
- C. Do not perform any field work, correct any deficiencies, or undertake installation until identified deficiencies and work required for correction have been reviewed and approved by Designer of Record or Owner/Operator or Construction Manager.
- D. The Installer shall examine the wash system for workmanship, finish, and dimensional accuracy. Compare delivered equipment with packing lists and specifications to assure receipt of all items prior to commencing installation. Document all findings.

3.4 PREPARATION

- A. Manufacturer shall participate in scheduled pre-construction conference (call) with Customer's project team.
- B. Before installation, the Installer shall verify that site conditions agree with contract drawings. Inspect locations of rough-in work and utility stub-outs to ensure they match with equipment to be installed. Document any discrepancies or deviations that will affect system performance and report findings to Engineer or Architect.

3.5 INSTALLATION AND FIELD QUALITY CONTROL

- A. Install according to manufacturer's instructions and approved submittals.
- B. Coordinate field inspection in accordance with requirements of project specifications for Construction Progress Documentation.
- C. The wash system shall be installed by Manufacturer's employee, or by Manufacturer's approved independent Installer as required in section 1.7.E of this spec.
 - 1. Employee or Installer must be qualified and experienced in the installation, adjustment, and operation of equipment.

- D. The Manufacturer's employee or approved independent start-up technician shall supervise final connections, adjustments, calibration, and final testing of equipment.

3.6 COMMISSIONING AND FIELD TESTING

- A. Initial equipment start-up and testing shall be performed by the Manufacturer's employee. Comply with testing requirements of the project specifications.
 - 1. Make all necessary adjustments as required.
 - 2. Pre-operation checks and start-up shall be in accordance with Manufacturer's Operation and Maintenance (O&M) manual.
 - 3. Check all wiring connections and power voltage before energizing.
 - 4. Arrange for an adequate amount of detergent for performance testing.
- B. Check operation of all systems or equipment directly controlled by the wash system to ensure all functions, controls, monitors, and indicators are functioning properly and operating as a system.
- C. Conduct field test, witnessed by Customer, to demonstrate the system complies with the requirements specified.
- D. Manufacturer shall submit final test report and applicable test data demonstrating compliance with performance criteria of this specification within ten (10) business days from completion of successful testing and commissioning of wash system.

3.7 FIELD TRAINING

- A. Provide on-site field training in the operation and maintenance of the wash for designated Owner personnel including facility service technicians.
 - 1. Training shall be provided by Manufacturer's employee or designated representative.
 - 2. Training shall be no less than 4 hours during normal business hours.
 - 3. Provide training for up to 10 attendees.
 - 4. Conduct training after substantial completion, but before final acceptance.
- B. Train attendees on wash operation, operational safety, maintenance, adjustment, cleaning, and manual operation.
- C. Deliver electronic copy of training manual plus (2) additional hard copies of the O&M manual to the project site.

3.8 CLOSE-OUT DOCUMENTATION

- A. Submit the following in accordance with Div. 01 General Requirements for Closeout Submittals:
 - 1. O&M manuals
 - 2. As-Record drawings derived from contractor supplied As-Built drawings.
 - 3. Wash specific Preventative Maintenance instructions and service schedule. readiness.

4. Manufacturer recommended spare parts list with part numbers, quantities, and pricing.
 - a. Include components which are not readily available from local or commercial sources, but which are critical to the operation of the system.
 - b. Spare parts are those that can be field replaced.
 - c. Consumables are items frequently required for maintenance and service such as lights, fuses, lubricants, hydraulic fluid, filters, etc.
 - d. Provide part numbers, quantities, descriptions, and current unit prices.
5. Manufacturer's Equipment Warranty statement.

END OF SECTION 11 11 26

**SECTION 11 40 00
FOODSERVICE EQUIPMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including general and supplementary conditions and division 01 specifications sections, apply to this section.

1.2 SUMMARY

- A. Supply, deliver and set in place all food service equipment at identified locations, and level before and after final connections by others. FEC to coordinate with authorized service agents any start up requirements called out in this written specification as well as provide prompt demonstrations to owner. FEC to coordinate with authorized service agents any start up requirements called out in this written specification as well as provide prompt demonstrations to owner.

1.3 DEFINITIONS

- A. Products: items obtained for incorporating into the work, whether purchased for project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, which is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-design product specification: a specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Substitutions: changes in products, materials, equipment, and methods of construction from those required by contract documents. Substitutions require approval by architect for use or implementation.
 - 1. Substitutions provisions are handled under Division 01 Section.

1.4 REFERENCES

- A. All food service refrigeration equipment must comply with C403.10 refrigeration equipment performance equipment of the 2020 Energy Conservation code of New York State.
- B. All food service equipment provided and installed must comply with below agencies, state department

of health and county or local laws and ordinance.

- C. American society for testing materials (ASTM):
 - 1. ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 - 2. ASTM A446, Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
 - 3. ASTM C1036, Specification for Flat Glass.
 - 4. ASTM C1048, Specification for Heat Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
- D. American Welding Society (AWS).
- E. National Electrical Manufacturers Association (NEMA).
- F. National Fire Protection Association (NFPA 96).
- G. National Sanitation Foundation (NSF).
- H. Underwriters Laboratories Listing (UL).
- I. Reference Standard AGS Grease Hoods, ductwork and fire extinguishing system per NYSBC 904.2.1
- J. All Walk in boxes must comply with the following:
 - 1. All Panels must comply with NYS ECCC C403.102 R value Requirements
 - 2. All walk in doors are to comply with OSHA 1910.36 exit hardware to prevent entrapment

1.5 SUBMITTALS

- A. Within sixty (60) days after award of contract (before equipment is purchased) the following shall be submitted in accordance with section 013300 submittal procedures.
 - 1. The submittal package will include the following: Product data book (cut sheet book) this product Databook should account for all item numbers in this contract up to and including spare numbers and existing equipment. Product data cut sheets shall be marked up in a way that indicates model and accessories included with the item.
 - 2. Submittal drawings will consist of the following: Custom shop drawings (hoods, walk-ins, millwork, serving lines custom fabrication, etc.) Equipment layout drawings, Plumbing connection drawings, electrical connection drawings, HVAC layout drawings and Special condition drawings (Wall backing, floor depressions, etc.)
 - 3. Submittal package shall be at least 98% complete at submission unless pre-approved by architect and CKC.
- B. Electronically submit (pdfs) assembly drawings, electrical and mechanical rough-in connection plans, details for plumbing, electrical, air conditioning and ventilation services for all kitchen equipment and brochures, catalog cut-sheets, specifications and operating characteristics for buy-out equipment. Clearly indicate any deviations from contract documents, such as arrangement of piping, connections, wiring method of fabrication, manner of structural conditions, standard shop practices, or other reasons, and note in cover sheet accompanying submittals.

- C. Drawing of fabricated equipment shall not be less than 3/4" equal one-foot scale.
- D. Rough-in drawings shall not be less than 1/4" equal one-foot scale.
- E. Product data: provide data on appliances; indicate configuration, sizes, materials, finishes, locations, utility connections and locations.
- F. Samples: submit samples of stainless steel and other finish materials for color selection.
- G. Manufacturer's installation instructions: indicate special procedures and perimeter conditions requiring special attention.
- H. Manufacturer's certificate: certify that exhaust system and tests meet or exceed specified requirements.
- I. It shall be the FEC responsibility to coordinate all color selections that are not already selected with the Architect. Any color selections stated in written specifications shall be confirmed by the FEC with Architect prior to ordering.

1.6 CLOSEOUT SUBMITTALS

- A. Within thirty (30) days after completion of contract the following shall be submitted.
 - 1. Operation and Maintenance Data:
 - a. Operation Data: Provide manuals with a sequence of operation and utility connection diagram explaining system operation and corresponding to actual devices. After approval, submit 2 sets of three ring binders and an electronic copy.
 - b. Maintenance Data: Provide lubrication and periodic maintenance requirement schedules.
 - c. Within this manual Provide serial numbers on all equipment including walk in boxes and refrigeration when manual covers more than one model, indicate model provided.
 - d. FEC to indicate model of items provide NO generic manuals will be accepted.
 - 2. Warranty letter by the FEC (Food Service Equipment Contractor) stating date of completion of installation for warranty issues.
 - 3. Demonstration sign in sheet listing what was demonstrated and all parties that attended this demonstration.
 - 4. Equipment keys and spare parts list to include what was turned over and to whom.
 - 5. Signed by owner or owner's representative the punch list determining that all punch list items have been completed and to the owner's satisfaction.
 - 6. Provide documentation on all cooking equipment startups performed by an authorized service agent.
 - 7. Documentation of start-ups by authorized service agent.
 - 8. Provide copy of Ansul tag and testing
 - 9. Provide signed transmittal of all spare parts and keys that have been turned over to CM/GC or owner.

1.7 QUALITY ASSURANCE

- A. Regulatory requirements:

1. Conform to applicable State and local codes for utility requirements.
 2. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc. as suitable for the purpose specified and indicated.
- B. Energy ratings: provide appliances with energy guide labels with energy cost analysis (annual operating costs) and efficiency information as required by federal trade commission.
1. Provide all appliances that are Energy Star Rated.

1.8 QUALIFICATIONS

- A. Installer: must have a minimum of 5 years documented installation experience with projects similar to this project.
- B. Fabricator: must specialize in manufacturing of commercial food services equipment with minimum 5 years' documented experience.
- C. Manufacturer: must specialize in manufacturing products specified in this section with a minimum of 5 years' documented equipment manufacturing experience.
- D. One qualified full-time site superintendent all be satisfactory to the owner and architect in all respects, and owner shall have the right to require contractor to dismiss from the project any superintendent whose performance is not satisfactory to owner and architect except with another superintendent satisfactory to the owner and architect in all respects. At the request of the architect, the contractor's superintendent shall attend project meetings, whether the project meetings are prior to the start of the contractor's work.
1. Contractor shall provide a superintendent with experience in managing project of this size and complexity with minimum three (3) projects including projects completed on time per contract. Experience shall be documents in writing from end user and design consultant.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Store products clear of floor in a manner to prevent damage.
- B. Coordinate size of access and route to place of equipment installation.
- C. Coordinate equipment delivery and installation with all other trades.
- D. Contractor takes all responsibility for equipment damage incurred before, during and after installation, until substantial completion has been determined by architect.
- E. One site superintendent all be satisfactory to the owner and architect in all respects, and owner shall have the right to require contractor to dismiss from the project any superintendent whose performance is not satisfactory to owner and architect except with another superintendent satisfactory to the owner and architect in all respects. At the request of the architect, the contractor's superintendent shall attend project meetings, whether the project meetings are prior to the start of the contractor's work.
1. Contractor shall provide a superintendent with experience in managing project of this size and complexity with minimum three (3) projects including projects completed on time per contract. Experience shall be documents in writing from end user and design consultant.

1.10 COORDINATION

- A. Coordinate existing equipment with owner per part 3 existing equipment.
- B. Coordinate with other trades to ensure existing equipment is disconnected prior to removal by this contractor. Supply and install all necessary drain traps, steam traps, vents, shut-offs, valves, pipe fittings, and/or other materials to complete final plumbing and electrical or steam connections between the rough-in and the connection or connections on each piece of equipment.
- C. Ductwork and ductwork connections from hoods collars to duct work provide by HVAC unless otherwise indicated.
- D. Install all drain fittings, tailpieces, faucets, operating switches, and/or starters.
- E. Coordinate sequencing of equipment installation with other trades prior to installing any piece of equipment.
- F. Coordinate special conditions with other trades, i.e. Floor depression, soda line conduit requirements, roof curbs, control wiring, etc.

1.11 WARRANTY

- A. Provide one (1) year parts and labor guarantee on all new equipment.
- B. Components of equipment subject to replacement prior to one year's use and those items which may fail due to improper or inadequate periodic maintenance by the owner/operator are not intended to be included within the scope of warranty.
- C. For all equipment that has refrigeration systems and semi-hermetic compressors, furnish an additional four (4) year warranty on all compressors.
- D. Guarantee/warranty period shall commence with the date of substantial completion.
- E. Warranty includes all costs incurred for removal and re-installation of the replacement component or equipment.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General product requirements: provide products that comply with the contract documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. All products shall be new. Use salvaged materials only where specifically directed to do so.
 - 3. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

4. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 5. Where products require color selection the Architect will make the selection.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 7. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product selection procedures:
1. Products:
 - a. Non-restricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 2. Manufacturers:
 3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

2.2 COMPARABLE PRODUCTS

- A. Conditions for consideration: architect will consider contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

2.3 MATERIALS

- A. Sheet steel: ASTM A446; 1.25 ounce per square foot galvanized coating.
- B. Stainless steel: ASTM A167; type 304 commercial grade, no. 4 finish.
- C. Glass: 3/16-inch float conforming to ASTM C1036 and ASTM C1048; exposed edges ground; cut or drilled to receive hardware.

- D. Plastic laminate: NEMA LD3; 0.050-inch-thick; color as selected by architect.
- E. Laminate backing sheets: LD3-BK20, 0.020-inch-thick, unfinished plastic laminate.
- F. Finish hardware: manufacturer's standard.
- G. Work surfaces: as specified.
- H. Fittings: sink drains with crumb cup and waste fittings, faucets, and electrical outlets.
- I. Service outlet covers and escutcheons: stainless steel.
- J. Service accessories and connections:
 1. Provide control switch or starter on each motor-driven appliance or heating element, under provisions of UL requirements.
 2. Provide internal wiring for equipment, including electrical devices, wiring controls, and switches to a common junction box.
 3. Provide suitable length of 4 wire cord with plugs to match building receptacles.
 4. Provide lamps for fixtures in equipment.
 5. Provide equipment with connection terminals, so that connections of plumbing, gas, steam, electrical, ventilation, and refrigeration services can be made. Where receptacles are specified for custom equipment, supply cut-outs and outlet boxes set in place accessible for connections of electrical work.

2.4 EQUIPMENT

- A. Provide rough-in hardware, supports and connections, attachment devices, closure panels, trim strips, and all accessories required for proper operation of equipment.
- B. Standard of comparison: the specified equipment has been established to set a standard of quality and features.
- C. If substitutions require different utility/building conditions, electrical, plumbing, ventilation, etc., from those specified, a complete list of those changes for each item shall be included with the request for substitution. Any costs associated with these changes will become the responsibility of this contractor.
- D. Verify direction of door swings.

2.5 FABRICATION

- A. General requirements:
 1. Stainless Steel Fastenings and Fittings: Bolts and screws with countersunk flat heads at interior and exterior visible or accessible surfaces. Use concealed fastenings where possible
 2. Form edges smooth. Fabricate sheet material for work surfaces, facings, shelves, and drainboards of straight length in one continuous sheet when not over 12 feet in length.
 3. Fix leg-mounted units by dowelling to floor with 1/4-inch stainless steel pins, where vibration or oscillation is anticipated.
 4. Provide legs with stainless steel adjustable feet. Fasten legs to equipment securely and rigidly.

5. Install rubber or nylon button feet or other protective device on bearing surface of any item positioned on a finished surface.
 6. Isolate rotating or reciprocating machinery to prevent noise and vibration.
 7. Provide accommodation for installation of final connections by other trades and accessibility to components such as compressors, junction boxes, etc....
 8. Grind welds of stainless-steel smooth and flush; polish to match adjacent surfaces.
 9. Cut and drill components for service outlets and fixtures.
 10. Provide access panels where required to access utilities.
 11. Shop assemble work where possible.
- B. Load carrying counter surfaces: reinforce frame support system and surfaces so that surfaces may safely support a load of 200 pounds concentrated on one square foot in any area or surface with no indentation showing on surface, and with permanent set not exceeding 0.005 inches.

2.6 FINISHES

- A. Metal (except stainless steel): degrease and phosphate etch followed by primer and minimum 2 coats factory baked epoxy enamel, color as selected by architect from manufacturer's full range of standard and custom colors.
- B. Plastic laminate: color as selected by architect from manufacturer's full range of standard and custom colors.
- C. Stainless steel: number 4 finish (unless indicated otherwise).
- D. Bituminous paint: sound deaden internal surfaces of metal work and underside of metal counters and sinks.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify all existing conditions and existing equipment requirements.
- B. Verify ventilation outlets, service connections, and supports are correct and in required location.
- C. Verify operational condition of existing equipment.
- D. Immediately upon finding, Report equipment discrepancies or non-operational equipment to the architect.

3.2 INSTALLATION

- A. Pre-installation site visits are required to obtain field measurements, verify finish dimensions, examine rough in progress and to coordinate with trades on site.
- B. Use anchoring devices approved by manufacture are made with a material that will not rust and are appropriate for equipment and expected usage.

- C. Verify equipment is installed in accordance with the manufacturer’s recommendations and requirement.
- D. Insulate to prevent electrolysis between dissimilar metals. Provide sealant to achieve clean joint without crevices.
- E. Weld and grind joints in stainless steel work tight, without open seams, where necessary due to limitations of sheet sizes or installation requirements.
- F. Sequence installation and erection to ensure mechanical, plumbing and electrical connections are achieved in an orderly and expeditious manner.
- G. Cut, fit, and patch where necessary. Coordinate work with other trades.
- H. Cut and drill tops, backs or other elements for service outlets, fixtures, and fittings.
- I. Provide access panel or cutting and patching of items of this section required for the installation or services of equipment.
- J. Remove and reinstall existing equipment required under this section. Foodservice equipment contractor shall verify condition of existing equipment prior to removal, if being reinstalled by this contractor or reused by owner.
- K. Protect new and existing equipment during construction phase as required to prevent damage to equipment.

3.3 EXISTING EQUIPMENT

- A. The owner reserves the right to keep any existing equipment, coordinate with owner on removal and transportation of equipment to a location of their choice. It shall be the responsibility of this contractor to salvage equipment the owner chooses not to retain.
 - 1. Prior to removal from the kitchen any equipment that is labeled existing & relocate, Existing & remains or existing & reuse, the FEC shall verify that the equipment is in working order and document via photos any damage and cleanliness Any damaged or not working equipment should be reported to GC/CM or Architect prior to moving.
 - a. GC/CM will coordinate with owner if additional funds are required to bring equipment to owner’s expectations.
- B. It shall be the responsibility of this contractor to salvage equipment the Owner chooses not to retain. FEC shall supply a list of salvage equipment (to include description, model, manufacture and serial number) to CM/GC/Owner for sign off prior to removal. Provide document in FSE submittal process.
- C. MEP disconnections by related trades, move, store and re-install equipment, ready for utility connection.
- D. Coordinate scope of work and timeline with owner and other trades prior to removal of existing equipment.

- E. Clean and re-furbish existing equipment to be re-used to “like new” condition, as noted.
 - 1. Prior to removal from the kitchen any equipment that is labeled existing & relocate, Existing & remains or existing & reuse, the FEC shall verify the cleanliness of existing equipment Any overly dirty/overly damaged equipment should be reported to the GC/CM or Architect prior to moving.
- F. It is the responsibility of this contractor to provide storage as required until the piece of equipment is installed or re-installed.
- G. It is the responsibility of this contractor to evacuate the refrigerant, dismantle and remove all refrigeration equipment associated with existing walk-in cooler, freezer or equipment with any refrigeration components (if applicable).

3.4 ADJUSTING

- A. Upon completion of installation, adjust new and existing equipment and apparatus to ensure proper working order and conditions.
- B. If a new piece of equipment is not functioning properly and determined to be non-repairable in the field it shall be removed and replaced with a new piece of equipment.
- C. Inspect all equipment and run each piece of equipment through a complete operating cycle to verify that equipment is fully operational.

3.5 CLEANING

- A. Cleaning shall be conducted prior to the turnover of the kitchen to the owner
- B. Remove masking or protective covering from stainless steel and other finished surfaces.
- C. Remove all packing materials and debris from jobsite.
- D. Wash and clean new and existing equipment.
- E. Polish glass, plastic, hardware and accessories, fixtures and fittings.

3.6 DEMONSTRATION AND TESTING

- A. Demonstrations shall be conducted prior to the turnover of the kitchen to owner. FSC shall provide a sign-in sheet from the demonstration showing attendance and what items were demonstrated. This document will be included with closeout documents. It is expected at the FEC will attend all demonstrations to ensure all were conducted. This document will be included with closeout documents. It is expected that the FEC will attend all demonstrations to ensure all were conducted.
- B. All demonstrations must be coordinated by the FEC and preformed prior to kitchen turnover. All demonstrations/training to be performed by a qualified manufactures representative. Demonstrations must include but not limited to operating procedures and maintenance.
- C. Individuals performing demonstration shall be fully knowledgeable of all operating and service

aspects of equipment.

- D. Demonstrations on all new equipment shall NOT be performed by the FEC. Document people in attendance.
- E. Test existing and new equipment to confirm equipment is operating as specified prior to demonstration. All testing of new equipment shall NOT be performed by the FEC.
- F. Start-up, test, and adjust new equipment. Authorized factory technicians shall start up equipment requiring testing and balancing, i.e. hoods, pulping systems, equipment with remote components, etc. IT SHALL BE THE RESPONSIBLY OF THIS CONTRACTOR TO PAY ANY SERVICE FEES TO RETURN TO SITE TO COMPLETE ANY START UPS THAT COULD NOT BE PREFORMED ON FIRST TRIP DUE TO INCOMPLETE FINAL CONNECTIONS
- G. All equipment that qualifies for factory startups will be coordinated by FEC and completed prior to equipment turnover to owner.
- H. IT SHALL BE THE RESPONSIBILITY OF THE FSC TO ENSURE THAT ALL START UPS ARE COMPLETED AND ANY RETURN TRIPS BY SERVICE AGENT TO FINISH DUE TO INCORRECT CONNECTIONS WILL BE PAID BY THIS CONTRACTOR.

PART 4 - LISTING OF FOODSERVICE EQUIPMENT

4.1 Item 1 – Soiled Dish Carts – One Lot (1 Lot) Required

- A. Eagle Group Model OBC-3A Dimensions: 40(h) x 20(w) x 19(d) Panco® Open Box Rack, holds (3) 21-3/4" x 15-3/4" x 5" boxes, welded aluminum construction, 5" Heavy duty casters. Provide all with the following:
 - 1. 1 ea. Model G Panco® Pan Stop, aluminum
 - 2. 2 ea. Model BBT-5 Box Tub, 1-compartment, 21-13/4 x 15-3/4", 5"D, high-density polyethylene
 - 3. 1 set Model A Casters, set of (2), with brakes

4.2 Item 2 – Soiled Break Down Tables (Existing Item To Be Relocated From Middle School) – One Lot (1 Lot)

4.3 Item 3 – Garbage Cans (By School District) – One Lot (1 Lot)

4.4 Item 4 – Mobile Condiment Station – One (1) Required

- A. Custom Model by R & D Design size and shape as shown on drawing # 46831. Approximately 36” Wide X 48” Long X 33 ¼” High. Cabinet to be made of metal frame construction all counters to have angle iron in all corners of the cabinet base for added structure Wood paneling to be a ¾” marine grade plywood with black laminated interior and back (operators’ side) provide a 4” base with plastic matching color toe kick for easy cleaning. Cabinet base to have a 3” overhang from toe kick. All cabinets to have dry storage compartments with locking hinged doors. All customer side openings will have a 4’ deep trim strip on base for step protection. Customer side (all exposed) laminate color to be Formica #8676-26 Swede Rift Oak FEC to confirm selection with Architect prior to ordering .

Operators side (all exposed) laminate to be color black. Provide a ½” inch solid surface top with color selection by Architect and coordinated by the FEC. Countertop to have a 1- ½” inch turn down on all sides.

- B. PROVIDE back splash, casters locking hinged doors under tray slide for storage PLEASE NOTE: unit will be mobile, by the school district drop in cold well Item #6 in will need to be wired to junction box and provide a cord and plug and access panel to plug unit in (district to provide bucket/pan for condensate)
- C. Provide coordinated trim strips at field joints and exposed corners ends and bottom of cabinet . As well as Inside cabinet bases provide a 4” deep stainless-steel protectors on the base of all cabinets.
- D. A 4 CM Tray slides are to be solid surface material 12” wide by 34” high and the length of cabinet. (see layout drawings for shape) Provide tray slide with stainless steel runners (if needed at field joints provide a 1” break on either side to accommodate for field seaming of the tray slide) and custom brushed stainless-steel brackets (MITERED). (Color selection to be Corian Stonique FEC to confirm with Architect prior to ordering . Counters to be shipped in a maximin of 120” field verify number of pieces required. FEC to provide field seaming for countertops. Color selection for counter tops and splash to be Wilsonart Quartz “Grey Lake” FEC to confirm this color selection prior to ordering.
- E. All drop-in equipment Piper single cold well item #6 to be shipped to R & D Designs by the FEC for factory installation. R & D Designs to provide proper insulation and ventilation using an insulated gasket and a coordinated color ventilation grill. Any controls behind ventilation grills to be hinged. All controls for drop-in equipment are to be mounted in cabinet back and easily accessible to operator. Drop in equipment to be wired to a junction box indicated on custom drawings. Drains to bucket/pan provided by the district
- F. Breath guards to by PMG item #5 to be shipped to R & D Design for factory installation any heat and light controls to be located so that it will be easily accessible to operator.
- G. All cabinets to be fully assembled in the factory to include any drop in food service equipment & breath protectors. All equipment to be inter-wired and inter-plumbed for final connections on site. The FEC will be responsible to fully seal any field MEP penetrations where rough ins do not coordinate with millwork.
- H. All cabinets to be fully assembled in the factory to include any drop in food service equipment and breath guards.
- I. Installation Notes:
 - 1. R & D Designs to provide custom shop drawings for approval these drawings to include an equipment schedule, junction box and any drain locations for coordination. R & D Design and FEC to coordinate any required field joints. FEC to be responsible for any field seaming that may be required. Field joint/Seaming to be completed by experienced seaming employee.
 - 2. All cabinets to be fully assembled in the factory to include any drop in food service equipment & breath protectors. All equipment to be inter-wired and inter-plumbed for final connections on site. The FEC will be responsible to fully seal any field MEP penetrations where rough ins do not coordinate with millwork.

3. All cabinets to be fully assembled in the factory to include any drop in food service equipment and breath guards.
4. R & D Designs will provide detailed step by step instructions and hardware on securing all cabinet field joints together. Cabinets at field joints must be completely secured prior to performing seaming of counter tops.
5. All field joint seaming will be the responsibility of the FEC and will be performed by personnel that is experienced in the techniques and procedures to do so. The FEC will be required to conduct a site visit prior to release of this counter to determine the amount of field seams that will be required to place unit in location. FEC will need to minimize the number of field seams needed. The maximum length of counters by R & D Design will be 120". Any counters larger than 120" will need to be shipped disassembled and will be the responsibility of the FEC to assemble in the field.
6. CKC nor R & D will not allow any field penetrations in the base of their cabinet any field penetrations will void manufacture warranty. It will be the sole responsibility for the FEC to provide this warranty per contract documents. The FEC must field verify and coordinate with trades on site the pre engineer penetration locations provided by the manufacture will be used for all rough ins to final connections any adjustments required will need to be done Prior to manufacturing
7. All millwork cabinets are required to be completely level prior to bolting units together and seaming. Leveling to be done with the minimum amount of shimming possible. Excess shimming by the FEC can cause cracking in laminate and counter tops. If this is to be determined it will be the responsibility of the FEC to correct/repair these issues. All cove bases are not to be installed until after the punch list has been completed by CKC. FEC to adjust during installation any door cabinet that are not line up due to the shipping process, in not doing so could cause laminate to crack due to pinch point from door to cabinet, if this is determined to be the cause of any laminate issues it will be the responsibility of the FEC to correct not the manufacture. All field joint seaming will be the responsibility of the FEC and will be performed by personnel that is experienced in the techniques and procedures to do so. The FEC will be required to conduct a site visit prior to release of this counter to determine the amount of field seams that will be required to place unit in location. FEC will need to minimize the number of field seams needed. The maximum length of counters by R & D Design will be 120". Any counters larger than 120" will need to be shipped disassembled and will be the responsibility of the FEC to assemble in the field.

4.5 Item 5 – Breath Protector – One (1) Required

- A. Premier Metal & Glass Model TM2S-A – Per drawing #157325 1" OD gearless adjustable food shield with top shelf, rear supports and slanted front support; 3/8" clear tempered glass with polished edges and radius corners; both end panels included (squared) with universal side panels; 644b-3/1 surface mounting option; No Heat or Light included; brushed stainless finish; approx. 22" cl length; approx. 82 lbs. ea. (2 END supports) single tier not to exceed 23 1/8" in height narrow flanges to protect item #6.
 1. FEC to ship to R & D for factory installation

4.6 Item 6 – Single Cold Well Unit – One Lot (1 Lot) Required

- A. Hatco Model CWBP-1 Dimensions: 32.1(h) x 19(w) x 27(d) Drop-In Refrigerated Well, (1) pan size,

top mount, electronic temperature control, condenser unit (cannot be rotated), sight glass, service valves, dryer/filter, insulated with drain, aluminized steel housing, stainless steel bezel, R-290, 1/5 HP, cULus, Made in USA . Provide with the following:

1. 1 ea. NOTE: Includes 24/7 parts & service assistance, call 414-671-6350
2. 1 ea. One year parts & labor warranty,
3. 1 ea. 120v/60/1-ph (domestic voltage)
4. 1 ea. Model CWB-1FB Perforated false bottom, for CWB-1
5. 3 ea. Model CWB12BAR 12" pan support bar
6. FEC to ship to R & D /Piper for factory installation

4.7 Item 7 - Cash Registers (Existing Item – Relocate) One Lot (1 Lot)

4.8 Item 8 - Cashier Station – One (1) Required

- A. Custom Model by R & D Design size and shape as shown on drawing # 46831 . Approximately 27” Wide X 60” Long X 33 ¼” High. (Cabinet to be made of metal frame construction all counters to have angle iron in all corners of the cabinet base for added structure Wood paneling to be a ¾” marine grade plywood with black laminated interior and back (operators’ side) provide a 4” base with plastic matching color toe kick for easy cleaning. Cabinet base to have a 3” overhang from toe kick. All cabinets to have dry storage compartments with locking hinged doors. All customer side openings will have a 4’ deep trim strip on base for step protection. Customer side (all exposed) laminate color to be Formica #8676-26 Swede Rift Oak FEC to confirm with Architect prior to ordering. Operators side (all exposed) laminate to be color black. Provide a ½” inch solid surface top with color selection by Architect and coordinated by the FEC. Countertop to have a 1- ½” inch turn down on all sides. Color to be Wilsonart Quartz “Grey Lake” FEC to confirm this color selection prior to ordering.
- B. PLEASE NOTE: PROVIDE LAMINATE ON ALL SIDES SO THAT THE DISTRICT CAN SEPARATE ITEM 8 & 10
- C. Provide coordinated trim strips at field joints and exposed corners ends and bottom of cabinet . As well as Inside cabinet bases provide a 4” deep stainless-steel protectors on the base of all cabinets.
- D. A 4 CM Tray slides are to be solid surface material 12” wide by 34” high and the length of cabinet. (see layout drawings for shape) Provide tray slide with stainless steel runners (if needed at field joints provide a 1” break on either side to accommodate for field seaming of the tray slide) and custom brushed stainless-steel brackets (MITERED). Color selection by Architect to be Corian Stonique FEC to confirm selection prior to ordering. Counters to be shipped in a maximin of 120” field verify number of pieces required. FEC to provide field seaming for countertops.
- E. R & D Designs will provide a coordinated corner strip for all corner, angles and field joints as well as a stainless-steel protector on the inside of all base cabinets these protective strips to be shown on drawings
- F. Cashier station to be provided with a tubular footrest and lockable cash drawer.
- G. Exterior cabinet receptacle (FOR ITEM 12) to be provided as shown on drawing. To be wired to a junction box. ADD AND ADDITIONAL 120/1 5-15P RECEPTCAL FOR FLEXIBLITY ON

FRONT OF COUTNER (SAME SIDE AS ITEM 12)

H. Installation notes:

1. R & D Designs to provide custom shop drawings for approval these drawings to include an equipment schedule, junction box and any drain locations for coordination. R & D Design and FEC to coordinate any required field joints. FEC to be responsible for any field seaming that may be required. Field joint/Seaming to be completed by experienced seaming employee.
2. All cabinets to be fully assembled in the factory to include any drop in food service equipment & breath protectors. All equipment to be inter-wired and inter-plumbed for final connections on site. The FEC will be responsible to fully seal any field MEP penetrations where rough ins do not coordinate with millwork.
3. All cabinets to be fully assembled in the factory to include any drop in food service equipment and breath guards.
4. R & D Designs will provide detailed step by step instructions and hardware on securing all cabinet field joints together. Cabinets at field joints must be completely secured prior to performing seaming of counter tops.
5. All field joint seaming will be the responsibility of the FEC and will be performed by personnel that is experienced in the techniques and procedures to do so. The FEC will be required to conduct a site visit prior to release of this counter to determine the amount of field seams that will be required to place unit in location. FEC will need to minimize the number of field seams needed. The maximum length of counters by R & D Design will be 120". Any counters larger than 120" will need to be shipped disassembled and will be the responsibility of the FEC to assemble in the field.
6. CKC nor R & D will not allow any field penetrations in the base of their cabinet any field penetrations will void manufacture warranty. It will be the sole responsibility for the FEC to provide this warranty per contract documents. The FEC must field verify and coordinate with trades on site the pre engineer penetration locations provided by the manufacture will be used for all rough ins to final connections any adjustments required will need to be done Prior to manufacturing
7. All millwork cabinets are required to be completely level prior to bolting units together and seaming. Leveling to be done with the minimum amount of shimming possible. Excess shimming by the FEC can cause cracking in laminate and counter tops. If this is to be determined it will be the responsibility of the FEC to correct/repair these issues. All cove bases are not to be installed until after the punch list has been completed by CKC. FEC to adjust during installation any door cabinet that are not line up due to the shipping process, in not doing so could cause laminate to crack due to pinch point from door to cabinet, if this is determined to be the cause of any laminate issues it will be the responsibility of the FEC to correct not the manufacture.

4.9 Item 9 – Spare Number**4.10 Item 10 - Cashier Station - One (1) Required**

- A. Custom Model by R & D Design size and shape as shown on drawing # 46831. Approximately 27" Wide X 60" Long X 33 ¼" High. (Cabinet to be made of metal frame construction all counters to have angle iron in all corners of the cabinet base for added structure Wood paneling to be a ¾" marine grade plywood with black laminated interior and back (operators' side) provide a 4" base with plastic

matching color toe kick for easy cleaning. Cabinet base to have a 3” overhang from toe kick. All cabinets to have dry storage compartments with locking hinged doors. All customer side openings will have a 4’ deep trim strip on base for step protection. Customer side (all exposed) laminate color to be Formica #8676-26 Swede Rift Oak FEC to confirm selection prior to ordering. Operators side (all exposed) laminate to be color black. Provide a ½” inch solid surface top with color selection by Architect and coordinated by the FEC. Countertop to have a 1- ½” inch turn down on all sides. Counter top to be Wilsonart Quartz “Grey Lake” FEC to confirm this color selection prior to ordering.

- B. PLEASE NOTE: PROVIDE LAMINATE ON ALL SIDES SO THAT THE DISTRICT CAN SEPARATE ITEM 8 & 10
- C. Provide coordinated trim strips at field joints and exposed corners ends and bottom of cabinet . As well as Inside cabinet bases provide a 4” deep stainless-steel protectors on the base of all cabinets.
- D. A 4 CM Tray slides are to be solid surface material 12” wide by 34” high and the length of cabinet. (see layout drawings for shape) Provide tray slide with stainless steel runners (if needed at field joints provide a 1” break on either side to accommodate for field seaming of the tray slide) and custom brushed stainless-steel brackets (MITERED). Color selection to be Corian Stonique FEC to confirm selection prior to ordering. Counters to be shipped in a maximin of 120” field verify number of pieces required. FEC to provide field seaming for countertops.
- E. R & D Designs will provide a coordinated corner strip for all corner, angles and field joints as well as a stainless-steel protector on the inside of all base cabinets these protective strips to be shown on drawings
- F. Cashier station to be provided with a tubular footrest and lockable cash drawer.
- G. Exterior cabinet receptacle (FOR ITEM 12) to be provided as shown on drawing. To be wired to a junction box. ADD AND ADDITIONAL 120/1 5-15P RECEPITCAL FOR FLEXIBLITY ON FRONT OF COUTNER (SAME SIDE AS ITEM 12)
- H. Installation notes:
 1. R & D Designs to provide custom shop drawings for approval these drawings to include an equipment schedule, junction box and any drain locations for coordination. R & D Design and FEC to coordinate any required field joints. FEC to be responsible for any field seaming that may be required. Field joint/Seaming to be completed by experienced seaming employee.
 2. All cabinets to be fully assembled in the factory to include any drop in food service equipment & breath protectors. All equipment to be inter-wired and inter-plumbed for final connections on site. The FEC will be responsible to fully seal any field MEP penetrations where rough ins do not coordinate with millwork.
 3. All cabinets to be fully assembled in the factory to include any drop in food service equipment and breath guards.
 4. R & D Designs will provide detailed step by step instructions and hardware on securing all cabinet field joints together. Cabinets at field joints must be completely secured prior to preforming seaming of counter tops.
 5. All field joint seaming will be the responsibility of the FEC and will be performed by personnel that is experienced in the techniques and procedures to do so. The FEC will be required to conduct

a site visit prior to release of this counter to determine the amount of field seams that will be required to place unit in location. FEC will need to minimize the number of field seams needed. The maximum length of counters by R & D Design will be 120". Any counters larger than 120" will need to be shipped disassembled and will be the responsibility of the FEC to assemble in the field.

6. CKC nor R & D will not allow any field penetrations in the base of their cabinet any field penetrations will void manufacture warranty. It will be the sole responsibility for the FEC to provide this warranty per contract documents. The FEC must field verify and coordinate with trades on site the pre engineer penetration locations provided by the manufacture will be used for all rough ins to final connections any adjustments required will need to be done Prior to manufacturing
7. All millwork cabinets are required to be completely level prior to bolting units together and seaming. Leveling to be done with the minimum amount of shimming possible. Excess shimming by the FEC can cause cracking in laminate and counter tops. If this is to be determined it will be the responsibility of the FEC to correct/repair these issues. All cove bases are not to be installed until after the punch list has been completed by CKC. FEC to adjust during installation any door cabinet that are not line up due to the shipping process, in not doing so could cause laminate to crack due to pinch point from door to cabinet, if this is determined to be the cause of any laminate issues it will be the responsibility of the FEC to correct not the manufacture.

4.11 Item 11 - Ice Cream Merchandiser (Existing Item – Relocate) – One (1)

4.12 Item 12 – Refrigerated Merchandiser – One (1) Required

- A. Structural Concepts Model FSE460R Dimensions: 60.62(h) x 50.75(w) x 36.12(d) Oasis® Self-Service Refrigerated End Cap Case, 50-3/4"W, 60-5/8"H, curved open front, (3) non-lit adjustable metal shelves, top light, black interior & lower front panel, (1) full end panel with mirror, includes price tag molding (matches interior color), levelers, Breeze self-contained refrigeration system, R290 Hydrocarbon refrigerant, cETLus, ETL-Sanitation. Provide with the following:
 1. 1 ea. NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
 2. 1 ea. Warranty: 1 year parts & labor warranty, 5 year compressor warranty
 3. 1 ea. Refrigeration: Breeze self-contained refrigeration
 4. 1 ea. Electrical Connection: 6' NEMA 6-20P, 208-240v/60/1-ph straight blade power cord
 5. 1 ea. Base Support: Casters with levelers (self-cont.),
 6. 1 ea. Model ZZSTRUCM4021 Interior Color: Stainless steel
 7. 1 ea. Exterior Color: Laminate (non-stock colors) Formica #8676-26 Swede Rift Oak FEC to confirm selection prior to ordering
 8. 1 ea. Model GRAIN DIRECTION Standard laminate grain directions (when applicable):
 9. - Front Panels (Upper Header and Lower Panels): Horizontal grain direction
 10. - End Panels: Vertical grain direction
 11. - Blend & Reveal Cases Only: Horizontal grain direction on front and end panels
 12. 1 ea. Thermometer: Digital Fahrenheit thermometer
 13. 1 ea. Shelving: (2) LED Lighted metal shelves
 14. 1 ea. Price Tag Molding: Price tag molding (matches interior color)
 15. 1 ea. Vinyl Graphics: None, standard
 16. 1 ea. Heat Treated Crating: None, standard

4.13 Item 13 - Milk Coolers – Two (2) Required

- A. Continental Refrigerator Model MC3NSSS Dimensions: 47(h) x 34(w) x 33(d) Milk Cooler, 34" long, single access, forced air cooling, (8) 13" x 13" x 11" or (4) 19" x 13" x 11" crate capacity, door cylinder security lock, electronic control with digital display, hi-low alarm, hi/low temperature alarm, stainless steel interior & exterior, floor drain, (4) 5" swivel casters with front locking brakes, R290 Hydrocarbon refrigerant, 1/4 HP, cETLus, NSF, ENERGY STAR®. Provide each with the following:
1. warranty: 7 year parts, labor, and compressor
 2. 1 ea. 115v/60/1-ph, 5.7 amps, cord, NEMA 5-15P,
 3. 1 ea. Custom laminate finish Formica #8676-26 Swede Rift Oak FEC to confirm selection prior to ordering

4.14 Item 14 - Mobile Tray & Silverware Carts - One Lot (1 Lot) Required

- A. Piper Products/Servolift Eastern Model PTS/1014MO Dimensions: 52.63(h) x 14.5(w) x 18.5(d) Mobile Tray & Silverware Dispenser, double stack, open style, (6) cylinders, holds (150) 10-3/4" x 15-1/8" trays, stainless steel, NSF (silverware cylinders are not included). Provide each with the following
1. 1 year warranty parts and labor
 2. 6 ea. Model 159-2701 Silverware Cylinder, 4-1/2" dia. x 5-5/8"H, beige plastic (each)
 3. 1 set Model -WB Wheel brakes (set of 2)
 4. FEC to verify tray size with owner prior to ordering

4.15 Item 15 - Hot Entrée Station – One (1) Required

- A. Custom Model by R & D Design size and shape as shown on drawing # 46831 Approximately 36" Wide X 94-1/8" X 87-3/8" Long X 33 1/4" High. L SHAPE. Cabinet to be made of metal frame construction (unless the counter has a radial curve) all counters to have angle iron in all corners of the cabinet base for added structure Wood paneling to be a 3/4" marine grade plywood with black laminated interior and back (operators' side) provide a 4" base with plastic matching color toe kick for easy cleaning. Cabinet base to have a 3" overhang from toe kick. All cabinets to have dry storage compartments with locking hinged doors. All customer side openings will have a 4' deep trim strip on base for step protection. Customer side (all exposed) laminate color to be Formica #8676-26 Swede Rift Oak FEC to confirm selection prior to ordering. Operators side (all exposed) laminate to be color black. Provide a 1/2" inch solid surface top with color selection by Architect and coordinated by the FEC. Countertop to have a 1- 1/2" inch turn down on all sides. Provided solid surface end splash at wall. Counter top to be Wilsonart Quartz "Grey Lake" FEC to confirm this color selection prior to ordering.
- B. Provide coordinated trim strips at field joints and exposed corners ends and bottom of cabinet . As well as Inside cabinet bases provide a 4" deep stainless-steel protectors on the base of all cabinets.
- C. A 4 CM Tray slides are to be solid surface material 12" wide by 34" high and the length of cabinet. (see layout drawings for shape) Provide tray slide with stainless steel runners (if needed at field joints provide a 1" break on either side to accommodate for field seaming of the tray slide) and custom brushed stainless-steel brackets (ADD IF NEED MITERED). Color selection to be Corian Stonique FEC to confirm with Architect prior to ordering. Counters to be shipped in a maximin of 120" field

verify number of pieces required. FEC to provide field seaming for countertops.

- D. All drop-in equipment Item 16 hot food well and item 20 frost top to be shipped to R & D Designs by the FEC for factory installation. R & D Designs to provide proper insulation and ventilation using an insulated gasket and a coordinated color ventilation grill. Any controls behind ventilation grills to be hinged. All controls for drop-in equipment are to be mounted in cabinet back and easily accessible to operator. Drop in equipment to be wired to a junction box indicated on custom drawings. Drains will be accommodated by plumbing to floor.
- E. Breath guards item 17 & 19 to be shipped to R & D Design for factory installation any heat and light controls to be located so that it will be easily accessible to operator.
- F. R & D Designs will provide a coordinated corner strip for all corner, angles and field joints as well as a stainless-steel protector on the inside of all base cabinets these protective strips to be shown on drawings
- G. Installation Notes
 - 1. R & D Designs to provide custom shop drawings for approval these drawings to include an equipment schedule, junction box and any drain locations for coordination. R & D Design and FEC to coordinate any required field joints. FEC to be responsible for any field seaming that may be required. Field joint/Seaming to be completed by experienced seaming employee.
 - 2. All cabinets to be fully assembled in the factory to include any drop in food service equipment & breath protectors. All equipment to be inter-wired and inter-plumbed for final connections on site. The FEC will be responsible to fully seal any field MEP penetrations where rough ins do not coordinate with millwork.
 - 3. All cabinets to be fully assembled in the factory to include any drop in food service equipment and breath guards.
 - 4. R & D Designs will provide detailed step by step instructions and hardware on securing all cabinet field joints together. Cabinets at field joints must be completely secured prior to performing seaming of counter tops.
 - 5. All field joint seaming will be the responsibility of the FEC and will be performed by personnel that is experienced in the techniques and procedures to do so. The FEC will be required to conduct a site visit prior to release of this counter to determine the amount of field seams that will be required to place unit in location. FEC will need to minimize the number of field seams needed. The maximum length of counters by R & D Design will be 120". Any counters larger than 120" will need to be shipped disassembled and will be the responsibility of the FEC to assemble in the field.
 - 6. CKC nor R & D will not allow any field penetrations in the base of their cabinet any field penetrations will void manufacture warranty. It will be the sole responsibility for the FEC to provide this warranty per contract documents. The FEC must field verify and coordinate with trades on site the pre engineer penetration locations provided by the manufacture will be used for all rough ins to final connections any adjustments required will need to be done Prior to manufacturing
 - 7. All millwork cabinets are required to be completely level prior to bolting units together and seaming. Leveling to be done with the minimum amount of shimming possible. Excess shimming by the FEC can cause cracking in laminate and counter tops. If this is to be determined it will be

the responsibility of the FEC to correct/repair these issues. All cove bases are not to be installed until after the punch list has been completed by CKC. FEC to adjust during installation any door cabinet that are not line up due to the shipping process, in not doing so could cause laminate to crack due to pinch point from door to cabinet, if this is determined to be the cause of any laminate issues it will be the responsibility of the FEC to correct not the manufacture.

4.16 Item 16 - 4 Well Hot Food Unit – One (1) Required

- A. Piper Products/Servolift Eastern Model 4HFW-1DM Drop-In Hot Food Multi-Well, Electric, individual pan design, with drain, (4) pan size for 12" x 20" pans, (2) control box, stainless steel, infinite control-1-phase, 6400 watts, NSF & UL. Provide with the following:
1. 1 ea. 1 year warranty parts and labor
 2. 1 ea. 208V/60/1-ph, 23.1 amps, 4800 watts
 3. FEC to ship to R & D for factory installation

4.17 Item 17 - Breath Protector– One (1) Required

- A. Premier Metal & Glass Model TM2S-A-EXT - Per Drawing #157325 1" OD Gearless Adjustable Food Shield With Top Shelf, Rear Supports And Slanted Front Support; 3/8" Clear Tempered Glass With Polished Edges And Radius Corners; Both End Panels Included (Squared) With Universal Side Panels; 644b-3/1 Surface Mounting Option; Hatco Grnm Narrow Heat Lamp And Ultraslim Led Light In Complementary Colored Housing; Brushed Stainless Finish; Approx 67" CI Length; APPROX 192 LBS EA (2 END SUPPORTS) Single Tier Fully Adjustable Breath Guard With Slanted End Panels Heat & Light Not To Exceed 23 1/8" In Height Narrow Flanges With Flange Cover Guard To Protect Item 16 HOT FOOD UNIT
1. FEC to ship to R & D for factory installation

4.18 Item 18 - Spare Number

4.19 Item 19 - Breath Protector – One (1) Required

- A. Premier Metal & Glass Model TMT2S-A - 1" OD Per drawing # 157325 Two Tier Gearless Adjustable Food Shield With Top Shelf, Rear Supports And Slanted Front Support; 3/8" Clear Tempered glass With Polished Edges And Radius Corners; Both End Panels included (Squared) With Universal Side Panels; 644b-3/1 Surface Mounting Option; Ultraslim Led Light In Complementary Colored Housing; Brushed Stainless Finish; Approx 40" CI Length; Approx 192 Lbs. Ea (2 End Supports) DOUBLE Tier Fully Adjustable Breath Guard With Slanted End Panels WITH Light Not To Exceed 23 1/8" In Height Narrow Flanges With Flange Cover Guard To Protect Item 20 FROST TOP
1. FEC to ship to R & D for factory installation

4.20 Item 20 - Frost Top – One (1) Required

- A. Hatco Model FTBP-2 Dimensions: 17.21(h) x 39(w) x 28.94(d) Drop-In Frost Top, 39"L, accommodates (2) full size sheet pan, lighted on/off rocker switch, electronic adjustable temperature control can be mounted to either side of condensing unit or remotely up to 4' from unit, auto-defrost, self-contained refrigeration, R-290, 1/4 HP, cULus, Made in USA. Provide with the following:

1. 1 ea. NOTE: Includes 24/7 parts & service assistance, call 414-671-6350
2. 1 ea. One year parts only warranty,
3. 1 ea. 120v/60/1-ph, 345 watts, 1/5 HP (domestic voltage)
4. FEC to ship to R & D for factory installation

4.21 Item 21 – Mobile Tray Lowerators – One Lot (1 Lot) Required

- A. Piper Products/Servolift Eastern Model PT/1014MO Dimensions: 36.13(h) x 14.94(w) x 18.5(d) Mobile Tray Dispenser, solid bottom, self-leveling, single stack, holds (150) 10-3/4" x 15-1/8" trays, with corner bumpers, stainless steel all tubular frame, NSF. Provide with the following:
1. 1 year warranty parts and labor
 2. FEC to coordinate tray size with Architect prior to ordering

4.22 Item 22 – Breath Protector – One (1) Required

- A. Premier Metal & Glass Model TM2S-A – Per Drawing #157325 1" OD Gearless Adjustable Food Shield With Top Shelf, Rear Supports And Slanted Front Support; 3/8" Clear Tempered Glass With Polished Edges And Radius Corners; Both End Panels Included (Squared) With Universal Side Panels; 644b-3/1 Surface Mounting Option; Hatco Grnm Narrow Heat Lamp And Ultraslim Led Light In Complementary Colored Housing; Brushed Stainless Finish; Approx 63" Cl Length; Approx 164 Lbs. Ea. (2 End Supports) Single Tier Fully Adjustable Breath Guard With Slanted End Panels Heat & Light Not To Exceed 23 1/8" In Height Narrow Flanges With Flange Cover Guard To Protect Item 23 Pizza Warming Shelf
1. FEC to ship to R & D for factory installation

4.23 Item 23 - Pizza Warming Shelf – One (1) Required

- A. Hatco Model GRSB-60-I Dimensions: 2.88(h) x 61.5(w) x 21(d) Glo-Ray® Drop In Heated Shelf with Recessed Top, 61-1/2" x 21", 1/2" deep recessed surface area, hardcoat aluminum top, control thermostat, illuminated on/off switch & mounting bracket, NSF, CE, cUL, UL, UL EPH Classified, CSA. Provide with the following:
1. 1 ea. NOTE: Includes 24/7 parts & service assistance, call 414-671-6350
 2. 1 ea. 1-Yr Warranty on Blanket Heating Elements against burnout,
 3. 1 ea. 120v/60/1-ph, 1220 watts, 10.2 amps, NEMA 5-15P (domestic voltage),
 4. 1 ea. NOTE: Recommended for use in metallic countertop, verify that the material is suitable for temperatures up to 200 degree F
 5. 1 ea. Thermostat control with lighted rocker switch (available at time of purchase only),
 6. FEC to ship to R & D for factory installation

4.24 Item 24 - Heated Sandwich Slide – One (1) Required

- A. Hatco Model HXMS-42D Dimensions: 45.71(h) x 39.9(w) x 28.13(d) Slant Heated Merchandiser with LED Lighting Warmer, 42" W, countertop, dual shelf, (14) divider rods, (3) bulbs per shelf, thermostat, infrared heat, hardcoat aluminum base, tempered side glass hinged to post. Provide with the following:
1. 1 ea. NOTE: Includes 24/7 parts & service assistance, call 414-671-6350
 2. 1 ea. One year on-site parts & labor warranty, plus one additional year parts only warranty on

all Glo-Ray metal sheathed elements

3. 1 ea. 120/208v/60/1-ph, 2400 watts, 10 amps, NEMA L14-20P (domestic voltage),
4. 1 ea. Model BLACK Black, designer color (available at time of purchase only)
5. 1 ea. NOTE: Flip door not available for both front & rear configurations
6. 1 ea. NOTE: Flip door not available for both front & rear configurations
7. FEC to coordinate cord and plug with R & D

4.25 Item 25 - Hot Self Service Station – One (1) Required

- A. Custom Model by R & D Design size and shape as shown on drawing # 46831. Approximately 36” Wide X 124-3/8” Long X 33 1/4” High. Cabinet to be made of metal frame construction all counters to have angle iron in all corners of the cabinet base for added structure Wood paneling to be a 3/4” marine grade plywood with black laminated interior and back (operators’ side) provide a 4” base with plastic matching color toe kick for easy cleaning. Cabinet base to have a 3” overhang from toe kick. All cabinets to have dry storage compartments with locking hinged doors. All customer side openings will have a 4’ deep trim strip on base for step protection. Customer side (all exposed) laminate color to be Formica #8676-26 Swede Rift Oak FEC to confirm prior to ordering. Operators side (all exposed) laminate to be color black. Provide a 1/2” inch solid surface top with color selection by Architect and coordinated by the FEC. Countertop to have a 1- 1/2” inch turn down on all sides. Counter top to be Wilsonart Quartz “Grey Lake” FEC to confirm this color selection prior to ordering.
- B. Provide coordinated trim strips at field joints and exposed corners ends and bottom of cabinet . As well as Inside cabinet bases provide a 4” deep stainless-steel protectors on the base of all cabinets.
- C. A 4 CM Tray slides are to be solid surface material 12” wide by 34” high and the length of cabinet. (see layout drawings for shape) Provide tray slide with stainless steel runners (if needed at field joints provide a 1” break on either side to accommodate for field seaming of the tray slide) and custom brushed stainless-steel brackets (MITERED). Color selection to be Corian Stonique FEC to confirm with Architect prior to ordering. Counters to be shipped in a maximin of 120” field verify number of pieces required. FEC to provide field seaming for countertops.
- D. All drop-in equipment ITEM 23 PIZZA WARMING SHELF to be shipped to R & D Designs by the FEC for factory installation. R & D Designs to provide proper insulation and ventilation using an insulated gasket and a coordinated color ventilation grill. Any controls behind ventilation grills to be hinged. All controls for drop-in equipment are to be mounted in cabinet back and easily accessible to operator. Drop in equipment to be wired to a junction box indicated on custom drawings. Drains will be accommodated by plumbing to floor.
- E. Countertop equipment ITEM 24 HEATED SANDWICH SLIDE will be coordinated with R & D Design cord and plug penetration and grommet provided at solid surface as well as receptacle within cabinet base. Wired to junction box.
- F. Breath guards to ITEM 22 to be shipped to R & D Design for factory installation any heat and light controls to be located so that it will be easily accessible to operator.
- G. Installation Notes:
 1. R & D Designs to provide custom shop drawings for approval these drawings to include an

equipment schedule, junction box and any drain locations for coordination. R & D Design and FEC to coordinate any required field joints. FEC to be responsible for any field seaming that may be required. Field joint/Seaming to be completed by experienced seaming employee.

2. All cabinets to be fully assembled in the factory to include any drop in food service equipment & breath protectors. All equipment to be inter-wired and inter-plumbed for final connections on site. The FEC will be responsible to fully seal any field MEP penetrations where rough ins do not coordinate with millwork.
3. All cabinets to be fully assembled in the factory to include any drop in food service equipment and breath guards.
4. R & D Designs will provide detailed step by step instructions and hardware on securing all cabinet field joints together. Cabinets at field joints must be completely secured prior to performing seaming of counter tops.
5. All field joint seaming will be the responsibility of the FEC and will be performed by personnel that is experienced in the techniques and procedures to do so. The FEC will be required to conduct a site visit prior to release of this counter to determine the amount of field seams that will be required to place unit in location. FEC will need to minimize the number of field seams needed. The maximum length of counters by R & D Design will be 120". Any counters larger than 120" will need to be shipped disassembled and will be the responsibility of the FEC to assemble in the field.
6. CKC nor R & D will not allow any field penetrations in the base of their cabinet any field penetrations will void manufacture warranty. It will be the sole responsibility for the FEC to provide this warranty per contract documents. The FEC must field verify and coordinate with trades on site the pre engineer penetration locations provided by the manufacture will be used for all rough ins to final connections any adjustments required will need to be done Prior to manufacturing
7. All millwork cabinets are required to be completely level prior to bolting units together and seaming. Leveling to be done with the minimum amount of shimming possible. Excess shimming by the FEC can cause cracking in laminate and counter tops. If this is to be determined it will be the responsibility of the FEC to correct/repair these issues. All cove bases are not to be installed until after the punch list has been completed by CKC. FEC to adjust during installation any door cabinet that are not line up due to the shipping process, in not doing so could cause laminate to crack due to pinch point from door to cabinet, if this is determined to be the cause of any laminate issues it will be the responsibility of the FEC to correct not the manufacture.

4.26 Item 26 - Breath Protector – One (1) Required

- A. Premier Metal & Glass Model TM2S-A -Per Drawing # 157325 1" OD gearless adjustable food shield with top shelf, rear supports and slanted front support; 3/8" clear tempered glass with polished edges and radius corners; both end panels included (squared) with universal side panels; 644b-3/1 surface mounting option; Hatco GRNM narrow heat lamp and ultraslim led light in complementary colored housing; brushed stainless finish; approx. 55" cl length; approx. 164 lbs. ea. (2 end supports) Single tier fully adjustable breath guard with slanted end panels heat & light not to exceed 23 1/8" in height narrow flanges with flange cover guard to protect item ITEM 28 HOT/COLD UNIT
 1. FEC to ship to R & D for factory installation

4.27 Item 27 – Breath Protector – One Lot (1 Lot) Required

- A. Premier Metal & Glass Model TMT2S-A – Pre Drawing #157325 1" OD two tier gearless adjustable food shield with top shelf, rear supports and slanted front support; 3/8" clear tempered glass with polished edges and radius corners; both end panels included (squared) with universal side panels; 644b-3/1 surface mounting option; ultraslim led light in complementary colored housing; brushed stainless finish; approx. 40" cl length; approx. 192 lbs. ea. (2 end supports) DOUBLE tier fully adjustable breath guard with slanted end panels WITH light not to exceed 23 1/8" in height narrow flanges with flange cover guard to protect item 29 FROST TOP
1. FEC to ship to R & D for factory installation

4.28 Item 28 – 3 Well Hot/Cold Unit – One (1) Required

- A. Duke Manufacturing Model HCF-3 Dimensions: 25.94(h) x 48.82(w) x 25.5(d) Hot/Cold/Freeze Drop-In Food Well Unit, 48-13/16"W x 25-1/2"D x 25-13/16"H, flush mount pans, (3) 12" x 20" individual pan, individual wired remote digital controls for hot or cold operation, individual drain, 6 ft. cord & plug, cULus, UL EPH Classified. Provide with the following:
1. 1 ea. Model HCF-3-120 120v/60/1-ph, 18.4 amps, NEMA L5-30P
 2. FEC to ship to R & D for factory installation

4.29 Item 29 - Frost Top Units – Three (3) – Required

- A. Hatco Model FTBP-2 Dimensions: 17.21(h) x 39(w) x 28.94(d) Drop-In Frost Top, 39"L, accommodates (2) full size sheet pan, lighted on/off rocker switch, electronic adjustable temperature control can be mounted to either side of condensing unit or remotely up to 4' from unit, auto-defrost, self-contained refrigeration, R-290, 1/4 HP, cULus, Made in USA. Provide each with the following:
1. 1 ea. NOTE: Includes 24/7 parts & service assistance, call 414-671-6350
 2. 1 ea. One year parts only warranty,
 3. 1 ea. 120v/60/1-ph, 345 watts, 1/5 HP (domestic voltage)
 4. FEC to ship to R & D for factory installation

4.30 Item 30 – Hot/Cold Self Service Station – One (1) Required

- A. Custom Model by R & D Design size and shape as shown on drawing # 46831 Approximately 36" Wide X 133-7/8" Long X 33 1/4" High. (Cabinet to be made of metal frame construction all counters to have angle iron in all corners of the cabinet base for added structure Wood paneling to be a 3/4" marine grade plywood with black laminated interior and back (operators' side) provide a 4" base with plastic matching color toe kick for easy cleaning. Cabinet base to have a 3" overhang from toe kick. All cabinets to have dry storage compartments with locking hinged doors. All customer side openings will have a 4' deep trim strip on base for step protection. Customer side (all exposed) laminate color to be Formica #8676-26 Swede Rift Oak FEC to confirm selection prior to ordering. Operators side (all exposed) laminate to be color black. Provide a 1/2" inch solid surface top with color selection by Architect and coordinated by the FEC. Countertop to have a 1- 1/2" inch turn down on all sides. Counter top to be Wilsonart Quartz "Grey Lake" FEC to confirm this color selection prior to ordering.
- B. Provide coordinated trim strips at field joints and exposed corners ends and bottom of cabinet . As well as Inside cabinet bases provide a 4" deep stainless-steel protectors on the base of all cabinets.

- C. A 4 CM Tray slides are to be solid surface material 12” wide by 34” high and the length of cabinet. (see layout drawings for shape) Provide tray slide with stainless steel runners (if needed at field joints provide a 1” break on either side to accommodate for field seaming of the tray slide) and custom brushed stainless-steel brackets (ADD IF NEED MITERED). Color selection to be Corian Stonique FEC to confirm with Architect prior to ordering. Counters to be shipped in a maximum of 120” field verify number of pieces required. FEC to provide field seaming for countertops.
- D. All drop-in equipment ITEM 28 HOT/COLD WELL & ITEM 29 FROST TOP to be shipped to R & D Designs by the FEC for factory installation. R & D Designs to provide proper insulation and ventilation using an insulated gasket and a coordinated color ventilation grill. Any controls behind ventilation grills to be hinged. All controls for drop-in equipment are to be mounted in cabinet back and easily accessible to operator. Drop in equipment to be wired to a junction box indicated on custom drawings. Drains will be accommodated by plumbing to floor.
- E. Breath guards ITEM 26 & 27 to be shipped to R & D Design for factory installation any heat and light controls to be located so that it will be easily accessible to operator.
- F. Installation Notes
 1. R & D Designs to provide custom shop drawings for approval these drawings to include an equipment schedule, junction box and any drain locations for coordination. R & D Design and FEC to coordinate any required field joints. FEC to be responsible for any field seaming that may be required. Field joint/Seaming to be completed by experienced seaming employee.
 2. All cabinets to be fully assembled in the factory to include any drop in food service equipment & breath protectors. All equipment to be inter-wired and inter-plumbed for final connections on site. The FEC will be responsible to fully seal any field MEP penetrations where rough ins do not coordinate with millwork.
 3. All cabinets to be fully assembled in the factory to include any drop in food service equipment and breath guards.
 4. R & D Designs will provide detailed step by step instructions and hardware on securing all cabinet field joints together. Cabinets at field joints must be completely secured prior to performing seaming of counter tops.
 5. All field joint seaming will be the responsibility of the FEC and will be performed by personnel that is experienced in the techniques and procedures to do so. The FEC will be required to conduct a site visit prior to release of this counter to determine the amount of field seams that will be required to place unit in location. FEC will need to minimize the number of field seams needed. The maximum length of counters by R & D Design will be 120”. Any counters larger than 120” will need to be shipped disassembled and will be the responsibility of the FEC to assemble in the field.
 6. CKC nor R & D will not allow any field penetrations in the base of their cabinet any field penetrations will void manufacture warranty. It will be the sole responsibility for the FEC to provide this warranty per contract documents. The FEC must field verify and coordinate with trades on site the pre engineer penetration locations provided by the manufacture will be used for all rough ins to final connections any adjustments required will need to be done Prior to manufacturing
 7. All millwork cabinets are required to be completely level prior to bolting units together and seaming. Leveling to be done with the minimum amount of shimming possible. Excess shimming

by the FEC can cause cracking in laminate and counter tops. If this is to be determined it will be the responsibility of the FEC to correct/repair these issues. All cove bases are not to be installed until after the punch list has been completed by CKC. FEC to adjust during installation any door cabinet that are not line up due to the shipping process, in not doing so could cause laminate to crack due to pinch point from door to cabinet, if this is determined to be the cause of any laminate issues it will be the responsibility of the FEC to correct not the manufacture.

4.31 Item 31 - Breath Protector – One (1) Required

- A. Premier Metal & Glass TM2S-A -Per Drawing #157325 1" OD Gearless Adjustable Food Shield With Top Shelf, Rear Option; Hatco Grnm Narrow Heat Lamp And Ultraslim Led Light Complementary Colored Housing; Brushed Stainless Finish; Approx 55" Cl Length; Approx 164 Lbs. Ea. (2 End Supports Single Tier Fully Adjustable Breath Guard With Slanted End Panels Heat & Light. Not To Exceed 23 1/8" In Height Narrow Flanges. With Flange Cover Guard To Protect Item 32 Hot Food Unit
 - 1. FEC to ship to R & D for factory installation

4.32 Item 32 - 3 Well Hot Unit – One (1) Required

- A. Piper Products/Servolift Eastern Model 3HFW-1DM Drop-In Hot Food Multi-Well, Electric, individual pan design, with drain, (3) pan size for 12" x 20" pans, control box, stainless steel, infinite-1-phase, 4800 watts, NSF & UL. Provide with the following
 - 1. 1 ea. 1 year warranty parts and labor
 - 2. 1 ea. 208V/60/1-ph, 17.3 amps, 3600 watts
 - 3. FEC to ship to R & D for factory installation

4.33 Item 33 - Hot/Cold Self Service Station – One (1) Required

- A. Custom Model by R & D Design size and shape as shown on drawing # 46831. Approximately 36" Wide X 73-3/4" X 87" Long X 33 1/4" High. Cabinet to be made of metal frame construction all counters to have angle iron in all corners of the cabinet base for added structure Wood paneling to be a 3/4" marine grade plywood with black laminated interior and back (operators' side) provide a 4" base with plastic matching color toe kick for easy cleaning. Cabinet base to have a 3" overhang from toe kick. All cabinets to have dry storage compartments with locking hinged doors. All customer side openings will have a 4' deep trim strip on base for step protection. Customer side (all exposed) laminate color to be Formica #8676-26 Swede Rift Oak FEC to confirm with Architect prior to ordering. Operators side (all exposed) laminate to be color black. Provide a 1/2" inch solid surface top with color selection by Architect and coordinated by the FEC. Countertop to have a 1- 1/2" inch turn down on all sides. Counter top to be Wilsonart Quartz "Grey Lake" FEC to confirm this color selection prior to ordering.
- B. Provide coordinated trim strips at field joints and exposed corners ends and bottom of cabinet . As well as Inside cabinet bases provide a 4" deep stainless-steel protectors on the base of all cabinets.
- C. A 4 CM Tray slides are to be solid surface material 12" wide by 34" high and the length of cabinet. (see layout drawings for shape) Provide tray slide with stainless steel runners (if needed at field joints provide a 1" break on either side to accommodate for field seaming of the tray slide) and custom

brushed stainless-steel brackets (MITERED). Color selection to be Corian Stonique FEC to confirm with Architect prior to ordering. Counters to be shipped in a maximum of 120" field verify number of pieces required. FEC to provide field seaming for countertops.

- D. All drop-in equipment 32 HOT FOOD UNIT & ITEM 29 FROST TOP to be shipped to R & D Designs by the FEC for factory installation. R & D Designs to provide proper insulation and ventilation using an insulated gasket and a coordinated color ventilation grill. Any controls behind ventilation grills to be hinged. All controls for drop-in equipment are to be mounted in cabinet back and easily accessible to operator. Drop in equipment to be wired to a junction box indicated on custom drawings. Drains will be accommodated by plumbing to floor.
- E. Breath guards ITEM 31 & 27 to be shipped to R & D Design for factory installation any heat and light controls to be located so that it will be easily accessible to operator.
- F. Installation Notes:
 1. R & D Designs to provide custom shop drawings for approval these drawings to include an equipment schedule, junction box and any drain locations for coordination. R & D Design and FEC to coordinate any required field joints. FEC to be responsible for any field seaming that may be required. Field joint/Seaming to be completed by experienced seaming employee.
 2. All cabinets to be fully assembled in the factory to include any drop in food service equipment & breath protectors. All equipment to be inter-wired and inter-plumbed for final connections on site. The FEC will be responsible to fully seal any field MEP penetrations where rough ins do not coordinate with millwork.
 3. All cabinets to be fully assembled in the factory to include any drop in food service equipment and breath guards.
 4. R & D Designs will provide detailed step by step instructions and hardware on securing all cabinet field joints together. Cabinets at field joints must be completely secured prior to performing seaming of counter tops.
 5. All field joint seaming will be the responsibility of the FEC and will be performed by personnel that is experienced in the techniques and procedures to do so. The FEC will be required to conduct a site visit prior to release of this counter to determine the amount of field seams that will be required to place unit in location. FEC will need to minimize the number of field seams needed. The maximum length of counters by R & D Design will be 120". Any counters larger than 120" will need to be shipped disassembled and will be the responsibility of the FEC to assemble in the field.
 6. CKC nor R & D will not allow any field penetrations in the base of their cabinet any field penetrations will void manufacture warranty. It will be the sole responsibility for the FEC to provide this warranty per contract documents. The FEC must field verify and coordinate with trades on site the pre engineer penetration locations provided by the manufacture will be used for all rough ins to final connections any adjustments required will need to be done Prior to manufacturing
 7. All millwork cabinets are required to be completely level prior to bolting units together and seaming. Leveling to be done with the minimum amount of shimming possible. Excess shimming by the FEC can cause cracking in laminate and counter tops. If this is to be determined it will be the responsibility of the FEC to correct/repair these issues. All cove bases are not to be installed until after the punch list has been completed by CKC. FEC to adjust during installation any door

cabinet that are not line up due to the shipping process, in not doing so could cause laminate to crack due to pinch point from door to cabinet, if this is determined to be the cause of any laminate issues it will be the responsibility of the FEC to correct not the manufacture.

4.34 Item 34 - Breath Protector – One (1)

- A. Premier Metal & Glass Model TM2S-A-EXT - Per Drawing #157325 1" OD Gearless Adjustable Food Shield With Top Shelf, Rear Supports And Slanted Front Support; 3/8" Clear Tempered Glass With Polished Edges And Radius Corners; Both End Panels Included (Squared) With Universal Side Panels; 644b-3/1 Surface Mounting Option; Hatco Grnm Narrow Heat Lamp And Ultraslim Led Light In Complementary Colored Housing; Brushed Stainless Finish; Approx 67" Cl Length; Approx 192 Lbs. Ea. (2 End Supports) Single Tier Fully Adjustable Breath Guard With Slanted End Panels Heat & Light Not To Exceed 23 1/8" in height narrow flanges with flange cover guard to protect Item 35 Hot Food Unit
 - 1. FEC to ship to R & D for factory installation

4.35 Item 35 - 4 Well Hot/Cold Unit– One (1) Required

- A. Duke manufacturing model HCF-4 dimensions: 25.94(h) x 64.5(w) x 25.5(d) hot/cold/freeze drop-in food well unit, 64-1/2"w x 25-1/2"d x 25-13/16"h, flush mount pans, (4) 12" x 20" individual pan, individual wired remote digital controls for hot or cold operation, individual drain, 6 ft. Cord & plug, CULUS, UL EPH classified. Provide with the following:
 - 1. 1 EA Model HCF-4-120 120V/60/1-PH, 23.6 AMPS, NEMA L5-30P
 - 2. FEC to ship to R & D for factory installation

4.36 Item 36 - Spare Number

4.37 Item 37 - Hot/Cold Self Service Station – One (1) Required

- A. Custom Model by R & D Design size and shape as shown on drawing # 46831 Approximately 36" Wide X 154-3/4" Long X 33 1/4" High. . Cabinet to be made of metal frame construction (unless the counter has a radial curve) all counters to have angle iron in all corners of the cabinet base for added structure Wood paneling to be a 3/4" marine grade plywood with black laminated interior and back (operators' side) provide a 4" base with plastic matching color toe kick for easy cleaning. Cabinet base to have a 3" overhang from toe kick. All cabinets to have dry storage compartments with locking hinged doors. All customer side openings will have a 4' deep trim strip on base for step protection. Customer side (all exposed) laminate color to be Formica #8676-26 Swede Rift Oak FEC to confirm prior to ordering. Operators side (all exposed) laminate to be color black. Provide a 1/2" inch solid surface top with color selection by Architect and coordinated by the FEC. Countertop to have a 1- 1/2" inch turn down on all sides. Counter top to be Wilsonart Quartz "Grey Lake" FEC to confirm this color selection prior to ordering.
- B. Provide coordinated trim strips at field joints and exposed corners ends and bottom of cabinet . As well as Inside cabinet bases provide a 4" deep stainless-steel protectors on the base of all cabinets.
- C. A 4 CM Tray slides are to be solid surface material 12" wide by 34" high and the length of cabinet. (see layout drawings for shape) Provide tray slide with stainless steel runners (if needed at field joints

provide a 1” break on either side to accommodate for field seaming of the tray slide) and custom brushed stainless-steel brackets (MITERED). Color selection to be Corian Stonique FEC to confirm with Architect prior to ordering. Counters to be shipped in a maximum of 120” field verify number of pieces required. FEC to provide field seaming for countertops.

- D. All drop-in equipment ITEM 29 HOT/COLD & ITEM 35 HOT /COLD UNIT to be shipped to R & D Designs by the FEC for factory installation. R & D Designs to provide proper insulation and ventilation using an insulated gasket and a coordinated color ventilation grill. Any controls behind ventilation grills to be hinged. All controls for drop-in equipment are to be mounted in cabinet back and easily accessible to operator. Drop in equipment to be wired to a junction box indicated on custom drawings. Drains will be accommodated by plumbing to floor.
- E. Breath guards to ITEM 34 & 27 to be shipped to R & D Design for factory installation any heat and light controls to be located so that it will be easily accessible to operator.
- F. Installation Notes:
 1. R & D Designs to provide custom shop drawings for approval these drawings to include an equipment schedule, junction box and any drain locations for coordination. R & D Design and FEC to coordinate any required field joints. FEC to be responsible for any field seaming that may be required. Field joint/Seaming to be completed by experienced seaming employee.
 2. All cabinets to be fully assembled in the factory to include any drop in food service equipment & breath protectors. All equipment to be inter-wired and inter-plumbed for final connections on site. The FEC will be responsible to fully seal any field MEP penetrations where rough ins do not coordinate with millwork.
 3. All cabinets to be fully assembled in the factory to include any drop in food service equipment and breath guards.
 4. R & D Designs will provide detailed step by step instructions and hardware on securing all cabinet field joints together. Cabinets at field joints must be completely secured prior to performing seaming of counter tops.
 5. All field joint seaming will be the responsibility of the FEC and will be performed by personnel that is experienced in the techniques and procedures to do so. The FEC will be required to conduct a site visit prior to release of this counter to determine the amount of field seams that will be required to place unit in location. FEC will need to minimize the number of field seams needed. The maximum length of counters by R & D Design will be 120”. Any counters larger than 120” will need to be shipped disassembled and will be the responsibility of the FEC to assemble in the field.
 6. CKC nor R & D will not allow any field penetrations in the base of their cabinet any field penetrations will void manufacture warranty. It will be the sole responsibility for the FEC to provide this warranty per contract documents. The FEC must field verify and coordinate with trades on site the pre engineer penetration locations provided by the manufacture will be used for all rough ins to final connections any adjustments required will need to be done Prior to manufacturing
 7. All millwork cabinets are required to be completely level prior to bolting units together and seaming. Leveling to be done with the minimum amount of shimming possible. Excess shimming by the FEC can cause cracking in laminate and counter tops. If this is to be determined it will be the responsibility of the FEC to correct/repair these issues. All cove bases are not to be installed

until after the punch list has been completed by CKC. FEC to adjust during installation any door cabinet that are not line up due to the shipping process, in not doing so could cause laminate to crack due to pinch point from door to cabinet, if this is determined to be the cause of any laminate issues it will be the responsibility of the FEC to correct not the manufacture.

4.38 Item 38 - Mobile Sheet pan Racks – One Lot (1 Lot) Required

- A. New Age Model 1335 Dimensions: 64(h) x 20.38(w) x 26(d) Roll-In Refrigerator/Proofer Rack, universal, open frame design, 64"H, wide angle slides for (18) 18" x 26" pans, slides on approximately 3" centers, all welded aluminum construction, end loading, (4) 5" platform casters, (2) swivel, (2) swivel with brakes, NSF, Made in USA, Provide with the following:
 1. Lifetime warranty against rust & corrosion, 5 year workmanship and material defects warranty
 2. FEC to verify racks fit in roll in refrigerators

4.39 Item 39 - 2 Door Roll in Refrigerators – Two (2) Required

- A. Continental Refrigerator Model D2RINSA Dimensions: 86(h) x 68.5(w) x 35.38(d) Designer Line Refrigerator, roll-in, two-section, self-contained refrigeration, stainless steel exterior, aluminum interior, standard depth cabinet, full-height solid doors, cylinder locks, electronic control with digital display, hi-low alarm, removable stainless-steel ramps, R290 hydrocarbon refrigerant, 1/2 HP, cETLus, NSF. Provide each with the following:
 1. 1 ea. warranty: 7 year parts, labor, and compressor
 2. 1 ea. 115v/60/1-ph, 9.4 amps, cord & plug
 3. 1 ea. Left Door hinged on left & right door hinged on right

4.40 Item 40 – Mobile Warming Cabinets – Two (2) Required

- A. Metro Model C589-SDS-UA Dimensions: 74.75(h) x 29.13(w) x 32.63(d) C5™ 8 Series Controlled Temperature Holding Cabinet with 6.8" touch-screen controls, mobile, full height, insulated, solid Dutch doors, universal wire slides, (17) 18" x 26" or (34) 12" x 20" x 2-1/2" pan capacity, 3" O.C. (adjustable on 1-1/2" increments), 5" casters, 304 stainless steel, 120v/60/1-ph, 2000 watts, 16.7 amps, NEMA 5-20P, cULus, NSF, Made in USA, ENERGY STAR®. Provide each with the following:
 1. 1 ea. 1 year warranty against manufacturing defects
 2. 1 ea. Right hand hinging.

4.41 Item 41 - Utility Carts – Two (2) Required

- A. Piper Products/Servolift Eastern Model 6-UCM-3 Dimensions: 39.25(h) x 39.25(w) x 23(d) Utility/Delivery Cart, (3) shelf medium, 600 lb. capacity, stainless steel construction, NSF. Provide each with the following:
 1. 1 ea. 1 year warranty parts and labor
 2. 1 set Model -WB Wheel brakes (set of 2)

4.42 Item 42 - Work Table W/Sink – One (1) Required

- A. Custom Model by EMI/MARLO size and shape as shown on drawing#25JS01 Approximately 30"

X 144" X 34" high. Top to be constructed of a 14-gauge 304 stainless steel with S/S channel edge construction. "C" channel bracing cylindrical gussets and mastic sound deadening. 6" back splash at 90 degree and ¾ turn down enclosed back and ends. 1 5/8" OD stainless legs adjustable s/s front flanged feet. 16-gauge under shelf the length of the table. Under Shelf to be welded to legs 10" AFF with S/S "C" Channel bracing. (excluding sink section)

- B. Provide TWO (2) 20" X 20" stainless steel drawers as seen on drawing. Drawers to be double pan construction with HD S/S rollers bearing, integral pull handle, lock and cutting boards.
- C. One (1) 20" x 20" X 10" deep coved construction prep sink with twist handle waste with bracket and overflow. No under shelf at sink area. To be NSF & UL approved
 - 1. 1 ea. T&S Brass Model B-0221-CR-KIT Pantry Faucet, double, deck mount, 8" deck mount mixing faucet with polished chrome plated brass body, 12" swing nozzle with stream regulator outlet, ceramic cartridges with check valves, lever handles, and 1/2" NPT female inlets, certified to ASME A112.18.1/CSA B125.1, NSF 61-Section 9 and NSF 372. Meets ADA ANSI/ICC A117.1 requirements

4.43 Item 43 – Hand Sinks – Two (2) Required

- A. Advance Tabco Model 7-PS-62 Dimensions: 17.25(h) x 17.25(w) x 15.25(d) Hand Sink, wall mounted, 14" wide x 10" front-to-back x 5" deep bowl, Deep Drawn™ sink bowl, 20 gauge 304 stainless steel, heavy duty splash mounted gooseneck faucet, knee valve, basket drain, keyhole wall mount bracket, NSF, cCSAus. Provide each with the following:
 - 1. 1 ea. Model 7-PS-10 P-trap, heavy duty, 1-1/2", 17 gauge
 - 2. 1 ea. Model K-170 Eye Wash Attachment, attaches to standard spout, adjustable aerated outlet heads, float-off dust covers, pull knob activation, removable aerator on bottom, chrome plated forged brass body (Not to be used with foot or knee operated units or electronic faucets) EYE WASH TO BE LOCATED IN DISH ROOM

4.44 Item 44 - Hose Reel W/ Control Cabinet – One (1) Required

- A. T&S Brass Model B-7242-C05 Hose Reel System, enclosed, 3/8" x 50' hose with stainless steel front trigger spray valve (with a 5/16" orifice), with ratcheting system & adjustable hose bumper, epoxy coated steel. Provide with the following:
 - 1. 1 ea 1 year limited warranty,
 - 2. 1 ea 1 year limited warranty for hose
 - 3. 1 ea 2 year limited warranty for hose reel
 - 4. 1 ea Fisher Model 1801 Reel Rinse Control Unit, valves, gauges and connections are completely enclosed within a stainless-steel cabinet, dual check backflow preventer, water hammer silencer, 90° panel lock, padlock hasp & finger latch, 1/2" NPT female inlets & outlets

4.45 Item 45 - Spare Number

4.46 Item 46 - 3 Compartment Sink – One (1) Required

- A. Custom Model by EMI/MARLO size and shape as shown on drawing#25JS01 Approximately 35" X 138" X 34" high. 1 5/8" OD S/S legs with adjustable S/S flanged feet on front legs, S/S adjustable

bullet feet on back 1 5/8" OD S/S cross bracing at 10" AFF, welded to legs. 14-gauge 304 S/S top with raised rolled edges. (finished edges if meets wall) S/S channel edge construction "C", channel bracing cylindrical gussets and mastic sound deadening. 10" back splash at 45 degree & 3/4 turn down enclosed back and ends.

- B. Three (3) 20" wide X 28" long X 14" deep S/S sinks coved corner with S/S apron coved corner. 36-1/4" left and right drain boards sloped to sink Lever waste valve with overflow and support bracket Accommodate for Two (2) 8" OC faucets. Finished edge if meets wall To be NSF & UL approved
1. 1 ea. T&S Brass Model B-0133-A12-B08 EasyInstall Pre-Rinse Unit, 8" wall mount, adjustable centers, EasyInstall 12" add-on faucet with stream regulator, spring action gooseneck, quarter-turn Eterna cartridges with spring checks, lever handles with color coded indexes, 18"rigid riser, 44" flexible stainless steel hose, 1.07 GPM JeTSpray spray valve, 6" adjustable wall bracket, 1/2" NPT, low lead, NSF, cCSAus
 2. 2 kt T&S Brass Model B-0230-K Installation Kit, (2) 1/2" NPT nipples, lock nuts & washers, (2) short "Ell" 1/2" NPT female x male
 3. 1 ea. T&S Brass 3 year limited warranty,
 4. 1 ea. T&S Brass Model B-0231-CR-KIT Pantry Faucet, double, wall mount, 8" centers, 12" swing nozzle, lever handles, stream regulator tip, quarter-turn Cerama cartridge, low lead, (2) 24" flex hose, 1/2" NPT, NSF, ADA Compliant
 5. 1 ea. T&S Brass Model 5F-8WLS12 Equip Faucet, 8" wall mount 12" swivel nozzle, lever handles & inlet supply kit, ceramic cartridges, low lead, ADA Compliant

4.47 Item 47 - Washer / Dryer (Existing Item – Relocate) – One (1)

4.48 Item 48 – Pot/ Pan Drying Rack – One Lot (1 Lot) Required

- A. Metro
1. (4) ea. Model MQ2454G Dimensions: 54(w) x 24(d) Quick Ship - MetroMax® Q Shelf, 54"W x 24"D, removable open grid polymer shelf mats on an epoxy coated steel frame with quick adjust corner releases, (4) wedge connectors, Microban® antimicrobial product protection, 600 lb. capacity per shelf, NSF
 2. 16 ea. Model MX74UP Quick Ship - Polymer trilobal post (compatible with MetroMax® i, MetroMax® 4, MetroMax® Q), 73-3/16"H, for use with stem casters, adjusts at 1" increments, corrosion proof all polymer construction with built in Microban® antimicrobial product protection
 3. 8 ea. Model 5PCX Quick Ship - Polymer Stem Caster, swivel, 5" dia., 1-1/4"W face, -20° F to 120°F temperature range, polyurethane wheel tread, 300 lb. capacity, NSF (donut bumpers included) (for use with all MetroMax posts & shelves)
 4. 8 ea. Model 5PCBX Quick Ship - Polymer Stem Caster, brake, 5" dia., 1-1/4"W face, -20° F to 120°F temperature range, polyurethane wheel tread, 300 lb. capacity, NSF (donut bumpers included) (for use with all MetroMax posts & shelves)
 5. 12 ea. Model MQ2460G Quick Ship - MetroMax® Q Shelf, 60"W x 24"D, removable open grid polymer shelf mats on an epoxy coated steel frame with quick adjust corner releases, (4) wedge connectors, Microban® antimicrobial product protection, 600 lb. capacity per shelf, NSF
 6. FEC to field measure to ensure a proper fit

4.49 Item 49 - Clean Dishtable – One (1) Required

- A. Custom model by EMI/MARLO size and shape as shown on drawing #25JS01 Approximately 90” long X 30” Wide X 34” high. 1 5/8” OD S/S legs with adjustable S/S flanged feet on front legs, S/S adjustable bullet feet on back 16 gauge under shelf the length of table. Under shelf to welded to legs 10” AFF. 14-gauge 304 S/S top with raised rolled edges. Top to be constructed of a 14-gauge 304 stainless steel with S/S channel edge construction. “C” channel bracing cylindrical gussets and mastic sound deadening. 10” Back Splash at 45 degree & ¾ turn down with enclosed back and ends. Provide cut out for dish machine table limit switch provided by this contractor. Finished edges at all walls. To be NSF & UL approved.

4.50 Item 50 – Spare Number

4.51 Item 51 - Vent Duct Risers – One lot (1 Lot) Required

- A. Custom model by EMI/MARLO size and shape as shown on drawing #25JS01 Approximately 4” x 16” with angle collar for each riser. 18-gauge 304 stainless steel. Include collar at ceiling. All seam to be continuously welded, ground and polished to eliminate any condensation. Vent stack shall run from vent cowl on the dish washer to 3” AFC. To be NSF approved

4.52 Item 52 - Dish Washer – One (1) Required

- A. Hobart Model CL44-ADV+BUILDUP Dimensions: 68.5(h) x 44.75(w) x 31.25(d) Conveyor Dishwasher, single tank, Automatic Soil Removal, Drain Water Energy Recovery with factory-installed drain water tempering kit; (202) racks/hour, .45 gallon/rack, Complete Delime with Booster Guard, Touch Screen Controls with diagnostics, troubleshooting, and SmartConnect App, capless wash arms, NSF Pot & Pan mode, pumped rinse, insulated hinged doors, cULus, NSF, ENERGY STAR®, Factory Startup – (FEC to Coordinate)Free for installations of a Hobart Service Office during normal business hours with appropriate notice; Provide with the following
1. 1 ea. warranty - 1-Year parts, labor & travel time during normal working hours within the USA
 2. 1 ea. Model CL44ADV-HTE15K Electric tank heat 15kW
 3. 1 ea. Model CL44ADV-ERH18K With 18 kW Booster (default)
 4. 1 ea. Model CL44ADV-ELE0AX 208v/60/3-ph
 5. Dual point connection
 6. 1 ea. Model CL44ADV-HGTHTS Higher than Standard 24”H x22”W opening, fits large oval trays, tall drink dispensers
 7. 1 ea. Model CL44BAS-DIRVER Verify direction of operation
 8. 1 ea. NOTE: For water of 3-grains of hardness or more, Hobart suggests adding a water softener.
 9. 1 ea. Model VNTHD/E-ADJ E-series vent hood domestic (adjustable)
 10. 4 ea. Model DISHRAK-PEG20 Peg Rack
 11. 4 ea. Model DISHRAK-COM20 Combination Rack
 12. 4 ea. Model BUNPAN-RACK Rack, bun pan
 13. 1 ea. Model PRESREG-1/20BR 1/2" brass pressure regulator
 14. 2 ea. Model 1/2INSHK-ABSRBR Water Shock Absorber Kit (2 required - 1 each incoming hot and cold water lines)
 15. 1 ea. Model TBLIM-CL Table limit switch for CL & CLEN series (send to EMI for installation).
 16. 1 ea. Model CL44EN-BASFETSTD Standard feet

4.53 Item 53 - Water Softener – One (1) Required

- A. Hobart Model WS80-NOINSTALL Dimensions: 28(h) x 20(w) x 22(d) Water softening system 4,818 grains/lb. capacity, 14 gallons regeneration volume, salt alarm, holds 2 bags of salt, FEC to coordinate INSTALLATION BY AUTHORIZED HOBART SERVICE OFFICE.

4.54 Item 54 -Scrapper/Collector W/Prerinse Unit – One (1) Required

- A. Salvajor Model S914 Dimensions: 35.88(h) x 24.81(w) x 22.25(d) Scrap Collector™, scrapping, pre-flushing & collecting system (widely accepted in areas where disposers are restricted), NEMA 4 HYDROLOGIC® control panel with patented operator sensor, two water saving modes (timed run & auto start/stop), safety line disconnect, LCD readout, salvage basin & silverware trap, scrap basket, 3/4 HP corrosion-resistant pump, pump intake screen, stainless steel construction, UL, CSA, CE, NSF. Provide With The Following:
1. 1 ea. Collector top to ship to EMI Marlo for factory installation
 2. 1 ea. Domestic factory authorized start up FEC to coordinate
 3. 1 ea. Domestic factory authorized demo, FEC to coordinate
 4. 1 ea. 208v/60/3-ph, 3.2 amps
 5. 1 ea. T&S Brass Model B-0133 EasyInstall Pre-Rinse Unit, wall mount mixing faucet with 8" adjustable centers, quarter-turn Eterna cartridges with spring checks, lever handles with color-coded indexes, 18" EasyInstall riser, 44" flexible stainless steel hose with heat-resistant gray handle & hold down ring, 1.15 GPM spray valve (B-0107), finger hook, polished chrome-plated brass faucet body, 1/2" NPT female inlets, CSA
 6. 1 ea. T&S Brass Model B-0109-01 Wall Bracket, 6"
 7. 1 kt T&S Brass Model B-0230-K Installation Kit, (2) 1/2" NPT nipples, lock nuts & washers, (2) short "EII" 1/2" NPT female x male

4.55 Item 55 - Soiled Dish Table – One (1) Required

- A. Custom model by EMI/MARLO size and shape as shown on drawing #25JS01 Approximately 108" long X 30" Wide X 34" high. 1 5/8" OD S/S legs with adjustable S/S flanged feet on front legs, S/S adjustable bullet feet on back 16 gauge under shelf the length of table. Under shelf to welded to legs 10" AFF. 14-gauge 304 S/S top with raised rolled edges.
- B. Top to be constructed of a 14-gauge 304 stainless steel with S/S channel edge construction. "C" channel bracing cylindrical gussets and mastic sound deadening. 10" Back Splash along all walls at 45 degree & ¾ turn down with enclosed back and ends. Provide 2 holes 8" OC in backsplash for pre-rinse unit. Fully weld in top of item# 54 in the tabletop. Finished edges at all walls. to be NSF & UL approved.

4.56 Item 56 – Soiled Dish Carts – One Lot (1 Lot) Required

- A. Eagle Group Model OBC-3A Dimensions: 40(h) x 20(w) x 19(d)Panco® Open Box Rack, holds (3) 21-3/4" x 15-3/4" x 5" boxes, welded aluminum construction, 5" Heavy duty casters. Provide each with the following:
1. 1 ea. Model G Panco® Pan Stop, aluminum
 2. 2 ea. Model BBT-5 Box Tub, 1-compartment, 21-13/4 x 15-3/4", 5"D, high-density

polyethylene

3. 1 set Model A Casters, set of (2), with brakes

4.57 Item 57 – Soiled Breakdown Table – One (1) Required

- A. Custom Model by Marlo size and shape as shown on drawing # 25JS01 Approximately 30” X 72” X 36: high. Provide with casters with ALL with brake , no under shelf cross braces on at customer side on ends and center brace coordinate location of center brace with item 58 , 14-gauge stainless steel top construction “C”: channel bracing cylindrical gussets and mastic sound deadening. Stainless steel legs, Provide (2) 12" cut out for trash receptacles (item #68) coordinate with item 58 NSF

4.58 Existing Equipment Removals:

- A. It is the responsibility of this contractor to fully remove and relocate all existing food service equipment, this includes removing the existing exhaust hoods (electric, plumbing & HVAC disconnections by related trades). Refer to 3.3 of this specification for existing equipment requirements.
 1. FEC to provide list to owner for sign off on all equipment being removed and disposed of prior to removing from the building.
 2. It is the responsibility of this contractor to fully remove existing walk-ins and all /any refrigeration systems not listed as existing and remains on contract documents and written specifications.

4.59 Reused Existing Equipment:

- A. This Kitchen Equipment Contractor (KEC) shall be responsible for identifying, tagging and/or removing all existing equipment, which will be reused. Verify and coordinate specific equipment with these plans and specifications, and the Owner. This shall include items existing, and the associated work necessary, at the time of the signing of the Contract for the Foodservice Equipment section; and shall not include any item(s) added, changed, or damaged (by other than the Kitchen Equipment Contractor (KEC)) after the signing; except to the extent of work which would have been included with the original existing item(s).
- B. Remove from existing locations, clean and renovate as noted below, store and re-install existing equipment to be reused, in the new locations as shown on plans; ready for utility connections, as appropriate. Existing equipment to be reused, with utility connections, shall be removed after disconnection as noted in below paragraph.
- C. Do work in cooperation with Owner, so that normal functioning of services is minimally interrupted. Coordinate all removal and replacement scheduling with the Construction Scheduling Manager (or similar responsible party), to ensure adequate time to complete the necessary work. If adequate time to properly relocate and reset the existing items and complete all cleaning and repair will not be available, due to continuing use of the existing item(s), or the allotted construction time; contact the Owner and obtain a written agreement as to what work is to be deleted or delayed; such as cleaning, repainting, or repairs.

- D. All surface dirt, grease, oil, food residues, ingredients, extraneous matter and other soiling materials shall be removed in order to obtain minimum acceptable sanitation and food service standards. Thorough final rinsing of all cleaning agents shall be at a minimum temperature of 180 degrees F where possible without damage to equipment or controls. Otherwise, use USDA approved cleaning agents and/or cleaning agents, which are acceptable for use with commercial food service equipment. This shall include all exterior surfaces of the existing equipment to be reused, and interior work surfaces such as inside oven compartments, fryer vats, ware washers, etc.
- E. All painted items with major paint blemishes shall be sanded, primed, and repainted to match the original color and type paint. Primer and paint shall be of a type approved for use with commercial food service equipment. All controls, lights, view windows, non-painted parts, etc. shall be protected as recommended by the Manufacturer. Minor paint blemishes shall be touched-up in a professional manner. This work shall be included in the Bid Submittal, as a separate line cost, at the end of the Bid Submittal.
- F. Replace or repair minor broken parts to produce a cleanable and functional item, where possible. Repairs and/or parts shall be for minor required items such as control knobs, handles, pilot lamps, belts, oil changes, minor adjustments and recalibrations, etc. This shall not include addition or replacement of any wearing components such as cutters, blades, etc.; or any accessory components such as mixer beaters, hooks, whips, etc., except for presently existing accessory components which are broken and nonfunctional, or as noted in the itemized specifications.

4.60 Existing Conditions:

- A. It is the responsibility of this contractor to fully review the existing conditions of the building and the new kitchen. This contractor shall be familiar with access to the kitchen location, including equipment access by elevators, stairwells, corridors, openings, including access around the exterior of the building for a crane or hoisting equipment (if required). It will be the responsibility of this contractor to coordinate equipment installation with the owner, CM, GC, etc....

4.61 Plumbing Of Equipment

- A. The plumbing and food service equipment contractors are to comply with 1370-a and 1110, Subpart 67-4 of Title 10 (Health) of the Official Compilation of Codes, Rules and Regulations of the State of New York. All outlet fixtures used for drinking or cooking shall be tested by Owner prior to being put into service. All test results in exceedance of the action level shall require the fixture to be replaced until satisfactory test results are obtained at no additional cost to Owner.”

PART 5 - DETAILS OF CONSTRUCTION

5.1 DETAIL DRAWINGS

DECEMBER 1, 2025

- A. The following details are a part of these specifications and shall be referred to for additional design requirements: Drawings FS-01, FS-2, FS-03 & FS-04

END OF SECTION 11 40 00

SECTION 11 66 23.53 – GYM WALL PADDING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide all equipment and materials and do all work necessary to furnish and install the athletic equipment, as indicated on the drawings and as specified herein. Athletic equipment shall include, but not be limited to:
 - 1. WCHI - High Impact Wall Pad; Z-Clip Top & Bottom

1.2 RELATED WORK

- A. Examine contract documents for requirements that affect work of this section. Other specification divisions and sections that directly relate to the work of this section may include, but are not limited to:
 - 1. 04 00 00 – Masonry
 - 2. 05 00 00 – Metals
 - 3. 06 00 00 – Wood, Plastics, and Composite
 - 4. 09 00 00 – Finishes
 - 5. 26 00 00 – Electrical

1.3 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. National Federation of State High School Associations (NFHS)
 - 2. American Sports Builders Association (ASBA)
 - 3. Manufacturer’s Data and Recommended Installation Requirements

1.4 SUBMITTALS

- A. Manufacturers Product Data
 - 1. Provide manufacturers product data prior to actual field installation work, for Architects or Owners representatives review.
- B. Shop Drawings
 - 1. Provide drawings of the manufacturer’s recommended installation and foundation requirements prior to actual field installation work, for Architects or Owners representatives review.

1.5 QUALITY ASSURANCE

- A. Manufacturers warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

1.6 PRODUCT DELIVERY AND STORAGE

- A. Materials delivered to the site shall be examined for damage or defects in shipping. Any defects shall be noted and reported to the Owner's representative. Replacements, if necessary, shall be immediately re-ordered, so as to minimize any conflict with the construction schedule. Sound materials shall be stored above ground under protective cover or indoors so as to provide proper protection.

PART 2 - PRODUCTS

2.1 WCHI - HIGH IMPACT WALL PAD; Z-CLIP TOP & BOTTOM

- A. Basis of Design: BASE: WCHI - High Impact Wall Pad; Z-Clip Top & Bottom as Manufactured by:

Sportsfield Specialties, Inc.
P.O. Box 231
41155 State Highway 10
Delhi, NY 13753
p. 888-975-3343
www.sportsfield.com

- B. Acceptable Manufacturers:

1. AK Athletic Equipment, Inc., 8015 Howe Industrial Pkwy., Canal Winchester, OH 43110
Phone: 614-920-3069; www.akathletics.com
2. Douglas Sports – 3441 S 11th Ave., Eldridge, IA 52748 Phone: 800-553-8907
www.douglas-sports.com

- C. COMPONENTS:

1. WCHI - High Impact Wall Pad; Z-Clip Top & Bottom:

- a. Indoor Vinyl Encasement:

- 1) High UV Resistance
- 2) Total Weight: 14 oz./yd² (ASTM D3776)
- 3) Construction: 9 x 9, 1000 x 1000 Denier
- 4) Grab Tensile: Warp 365 lb/in, Fill 348 lb/in (ASTM D5034)
- 5) Tongue Tear: Warp 92 lb/in, Fill 83 lb/in (ASTM D2261)
- 6) Adhesion: 28 lb/2" (ASTM D751)

- 7) Flame Resistance: Class 1 (ASTM E-84), CSFM, NFPA-701
 - 8) Cold Crack: -4° F (ASTM D2136)
 - 9) Rot, Mildew and Fungus Resistant: Yes
 - 10) Various Standard Colors Available
- b. 2" Thick High Impact Bonded Foam
 - 1) Density: 6 lb.
 - 2) Color: Natural (Varies)
 - 3) Made of Recycled Material and 100% Recyclable
 - c. 7/16" Oriented Strand Board (OSB) Backing
 - d. Impact Testing; Independently Certified:
 - 1) ASTM F2440-11; 10 lb. x 6.3" Dia. Hemisphere Head Form, 4' Drop Height:
 - a) G-max: 123
 - b) Head Injury Criterion (HIC): 428
 - e. Wall Mounting:
 - 1) Z-Clip Attachment at Top and Bottom
 - a) 18 Gauge Galvanized Steel
 - 2) Wall Fasteners Not Included (Applications Will Vary)
 - f. 1-Year Manufacturer's Limited Product Warranty
 - g. Optional:
 - 1) Custom High-Resolution Digitally Printed Graphics
 - 2) Specialized Column Pads Available Upon Request
 - h. See drawing for heights.

PART 3 - EXECUTION

3.1 INSTALLATION OF EQUIPMENT

- A. All protective padding shall be installed as recommended per manufacturer's written instructions and as indicated on the drawings. Installer should have a minimum of five (5) protective padding installations or similar experience in the previous three (3) years.

END OF SECTION 11 66 23.53

SECTION 11 66 23.56 - WRESTLING MAT STORAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Wrestling Mat Hoist.

B. Related sections:

1. Section 05 12 00: Structural steel framing to support Mat Hoist.
2. Section 26 05 33 and 26 05 21: Electrical supply, conduit, and wiring for Mat Hoist.

1.2 SUBMITTALS

A. Submit in accordance with Section 01 33 00 [01330]- Submittal Procedures:

1. List of proposed products and product data.
2. Shop drawings showing layout, elevations, dimensions, fabrication details, method of attachment, and electrical wiring diagrams.
3. Manufacturer's installation and maintenance instructions.

1.3 QUALITY ASSURANCE

- A. Source limitation: All components including suspension system, frame assembly, controls for mat lifter, shall be products of a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver equipment until building is enclosed and other construction within gymnasium is substantially complete.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturer: Draper, Inc. Sales offices and manufacturing facility located at: 411 South Pearl Street, Spiceland, Indiana 47385-0425; 765-987-7999.
- B. Manufacturers of equivalent products submitted and approved in accordance with Section 01 23 00 [01360] - Product Substitution Procedures.

2.2 WRESTLING MAT HOIST (ONE REQUIRED)

- A. Type: Model No. 502061 Double Mat Lifter – (Side by Side Sling)
- B. Construction: Mat Lifter construction shall consist of a 20 foot I-beam frame, with all drive and lifting mechanism enclosed in a sheet metal housing. Unit shall be a three cable system to assure balanced operation. Cables shall be attached to the I-beam frame and attach to the load bar, which shall be connected to fabric slings. Standard lifter, load bar, and slings shall be capable of supporting two standard 42 x 42 feet wrestling mats (weighing approximately 1 lb. per square foot). Mats may be one-piece or in sections placed end to end.

Each unit shall consist of a highly efficient hollow bored helical gear direct drive (2 inch) solid key shaft to an instantly reversing 1.5 HP motor, operating with 208/230/460 volts in 3-phase, including a 15 lb. fast action brake. Lifting and lowering speed shall be approximately 10 feet per minute. System shall have a custom integrated motion alarm which automatically sounds when system is in motion for safety.

Lifting drums shall be 4 inch diameter directly coupled to a 2 inch x 20 feet long solid keyed shaft. Three steel lift cables shall be 5/16 inch x 35 foot aircraft cable 7 x 19. Cables shall be rated at 1960 lbs. each at a 5-to-1 safety factor. System shall include an emergency lowering manual override brake, in case of power outage.

40 foot Load bar shall be connected to 22 ounce vinyl/polyester super sling able to accommodate up to a 40” diameter mat, with heavy duty straps and fasteners. Standard sling color is black; other colors are available by special request. For safety purposes, sling capacity shall govern the lift capacity of the system. Motors, drive assembly, and all control mechanisms shall be encased in a fire proof safety cover. Warranty shall be 10 years. Testing from independent laboratory on entire system and clamps to 17,500 lb.

Movement control shall be prewired with a furnished electrical key switch wired to an intrinsically safe 24 volt power system with automatic off return and raise/lower legend plate.

Wiring and conduit from hoist to key switch and electrical hook-up of unit by others.

Approximate unit weight shall be 1,750 lb. (not including mat).

2.3 ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL:

- A. All conduits complete with wire from power source to control enclosure, from control enclosure to unit.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate support of mat lifter with roof or wall structure to ensure proper distribution of loads and adequacy of attachment points. Ensure that building structure has been designed for loads of specific mat lifter to be provided. Provide additional structural framing members as required in accordance with Section 05 12 00.

- B. Coordinate configuration, size, and installation of mat lifter with height, slope, and type of building structure and lighting fixtures, mechanical equipment, ductwork, fire-suppression system, bleachers, athletic equipment, and other potential obstructions.
- C. Field verify dimensions prior to fabrication.
- D. Coordinate electrical requirements for motorized operating mechanism to ensure proper power source, conduit, wiring, and boxes for keyed switches. Prior to installation, verify type and location of power supply. See “Electrical Contractor Shall Provide and Install”
- E. Painting: Mat Lifter and parts shall be factory painted neutral gray enamel paint.
- F. For installations made after wood gymnasium flooring is installed, provide protection and exercise care not to damage flooring.
- G. Coordinate unloading and transport of mat lifter into facility insuring there is ample room to navigate large equipment into area where it is to be installed.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's written instructions and shop drawings.
- B. Install even, plumb and level.
- C. Install control switch such that operator has view of complete mat lifter during lowering and raising.
- D. Adjust limit switches to ensure accurate position in both stored and lowered positions.

3.3 TESTING AND DEMONSTRATION

- A. Operate mat lifter to ensure proper lifting and lowering. Adjust as required to ensure smooth operation and accurate positioning.
- B. Demonstrate to Owner's designated representatives complete operation and required maintenance.

END OF SECTION 11 66 23.56

SECTION 12 63 13.01 - TREAD MOUNTED BLEACHER SEATING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Manufacture, deliver and install Fixed, Tread Mounted Gymnasium Seating in accordance with applicable codes, the following specifications, and approved drawings.

1.2 RELATED WORK BY OTHERS

- A. Adequate riser levelness and strength for support of gym seats.

1.3 SYSTEM DESCRIPTION

- A. The gym seat system shall be multiple tiered seating rows comprised of concrete construction with plastic seat modules attached using proper attachment brackets and anchors.

1.4 QUALITY ASSURANCE

A. DESIGN LOAD CRITERIA(STRUCTURAL):

- 1. NFPA Standard: Comply with requirements of NFPA 102, "Standard for Assembly Seating, Tents and Membrane Structures", and specifically with Chapter 5, "Folding and Telescopic Seating", except where other requirements are indicated by the architect/owner.
- 2. Seating layout design shall be in compliance with *Code/Year* National Building Code.

- B. Manufacturer: Company specializing in telescopic seating with a minimum of 25 years' experience in manufacturing gym seats.

- C. Engineer Qualifications: Manufacturer to employ a registered, licensed Professional Engineer to certify that the equipment to be supplied meets or exceeds the design criteria of this specification.

- D. Installation: Shall be handled directly by the manufacturer or by a factory certified installation subcontractor.

- E. Product Liability: Certification of insurance coverage of not less than \$5,000,000.

- F. Welding Processes: To be performed by certified professional welding operators in accordance with American Welding Society, (AWS), D1,1 "Structural Welding Code-Steel".

- G. Product Improvements: Equipment provided shall incorporate manufacturer's design improvements and materials current at time of shipment, provided that such improvements and materials are consistent with the intent of these specifications.

1.5 SUBMITTALS

A. Bid Submittals

1. Manufacturer's descriptive literature and specifications.
2. List of deviations from these specifications, if any.

B. Job Submittals

1. Shop Drawings showing all equipment to be furnished with details of accessories to be supplied.
2. Samples of material and color finish as requested by Architect.
3. Warranty, operation and maintenance instructions to the owner upon completion.

1.6 WARRANTY

- A. The manufacturer shall warrant all work performed under these specifications to be free of defects for a period of Five years.
- B. Any materials found to be defective within this period will be replaced at no cost to the owner. This warranty shall not include replacements required by Acts of God, war, vandalism, flood, fire, calamity or deliberate abuse or misuse of the equipment.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. All gym seats shall be manufactured by Irwin Telescopic Seating Company, Altamont, IL 62411 or equal, subject to prior approval and compliance with these specifications.

2.2 MATERIALS

- A. Seating Area: Supply 18" Fixed injection molded plastic seat modules including support brackets and mounting hardware for permanent concrete risers. Plastic seats to be tread mounted directly to the concrete surface, with all mounting hardware properly positioned as to not cause structural damage to the concrete surface.
1. Colors: Refer to the Finish Legend in the Construction Documents.
- B. Dimensions:
1. Rise per Tread: 1'-4" riser, To be field verified.
 2. Tread Spacing: 2'-4" tread, To be field verified.

2.3 FABRICATION

A. Seat Systems:

1. Infinity Seat: Supply plastic modular 18” individual seats in 10” deep model. Seating to be scuff resistant injection molded high density polyethylene plastic.
 - a. Seat modules supplied shall be of a high aesthetic design using multiple textures, style lines and a water fall front. The rear of the seat shall be slightly curved to eliminate the straight-line appearance and include a moderate seat contour and texture to enhance spectator comfort.
 - b. Seating design shall be molded to achieve a finished end appearance without the use of end caps. The rear of the seat shall include a smooth wall allowing for the deck to be easily swept clean without obstruction.
 - c. Seat heights shall be maintained at a minimum of 16 3/4". Lower seat heights which detour from spectator comfort will not be accepted.
 - d. Foot space shall be maximized for spectator comfort and provide a minimum of 22” when measured with a 10” module.
 - e. Each seat to be designed with the capability of using seat numbers and row letters at the aisle locations. Seat numbers to be stylishly designed using a radius corner to enhance the aesthetic value of the seat. Seat numbers and row letters shall be recessed into the seat to protect against any vandalism.

2.4 ACCESSORIES

1. Seat numbers and row letters shall be supplied in a contrasting, but complementary color for easy seat identification. Layout of numbering to be coordinated with the architect/owner.

PART 3 - EXECUTION

3.1 REVIEWS AND APPROVALS

- A. Shop drawings shall be approved and job site field measurements taken prior to installation, and fixed gym seating shall be installed in conformance therewith.

3.2 INSTALLATION

- A. The installation of the fixed gym seating will be handled directly by the manufacturer or by a factory authorized installation subcontractor qualified to perform the installation function.

3.3 PROTECTION

- A. Instructions in both operation and maintenance shall be transmitted to the owner by the manufacturer's representative.

- B. Maintenance and operation of the fixed gym seating shall be the responsibility of the owner or his duly authorized representative, and shall include the following:
 - 1. An annual inspection and required maintenance of all fixed gym seating shall be performed to assure safe conditions. At least bi-annually the inspection shall be performed by a Professional Engineer or factory service personnel.
- C. Irwin Telescopic Seating Company constantly strives to improve its product and manufacturing methods; therefore, it reserves the right to make changes without notice which, in the opinion of Irwin Seating Company, shall improve the product.

END OF SECTION 12 63 13.01

SECTION 14 42 16 - FLEXSTEP V2 BY LIFTUP WHEELCHAIR LIFT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Indoor FlexStep V2 by Liftup wheelchair lifts.

1.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-In-Place Concrete: Anchor placement in concrete.
- B. Section 04 80 00 - Masonry Assemblies: Anchor placement in masonry.
- C. Section 06 10 00 - Rough Carpentry: Blocking in framed construction for lift attachment.
- D. Section 09 26 00 - Gypsum Board Assemblies: Stair walls.
- E. Division 16 - Electrical: Fire Alarm System: Building Fire Alarm Integration system to connect the lift control system with the building fire alarm system.
- F. Division 16 - Electrical: Electrical power service and wiring connections.
- G. Division 16 - Electrical: Concealed low voltage control wiring.
- H. Division 16 - Electrical: Intercom and wiring.

1.3 REFERENCES

- A. ASME A17.5 - Elevator and Escalator Electrical Equipment.
- B. ASME A18.1 2014 (US/FDA) - Safety Standard for Platform Lifts and Stairway Chairlifts.
- C. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- D. NFPA 70 - National Electric Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Submit manufacturer's installation instructions, including preparation, storage and handling requirements.
 - 2. Include complete description of performance and operating characteristics.

C. Shop Drawings:

1. Show typical details of assembly, erection and anchorage.
2. Include wiring diagrams for power, control, and signal systems.
3. Show complete layout and location of equipment, including required clearances.

D. Selection Samples: For each finished product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finished product specified, two samples, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm with minimum 25 years documented experience in manufacturing of inclined wheelchair platform lifts of installations of type specified.

B. Installer Qualifications: Firm licensed to install equipment of this scope, with evidence of experience with specified equipment. Installer shall maintain an adequate stock of replacement parts and have qualified people available to ensure timely maintenance and callback service at the project site.

1.6 REGULATORY REQUIREMENTS

A. Provide FlexStep V2 by Liftup:

1. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
 - a. The FlexStep V2 complies with key requirements of the ASME 18.1 Safety Standard for Platform lifts and Stairway Chairlifts.
2. ASME A17.5 - Elevator and Escalator Electrical Equipment.
3. NFPA 70 - National Electric Code.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store components off the ground in a dry covered area, protected from adverse weather conditions.

1.8 PROJECT CONDITIONS

A. Do not use wheelchair lift for hoisting materials or personnel during construction period.

1.9 PRODUCT LIMITED WARRANTY

- A. Subject to the terms and conditions set forth herein, Liftup A/S (“Liftup”) makes the following warranty only to its Resellers who purchase the FlexStep V2 product (“Product”) directly from Liftup: for a period of one (1) year from the date of shipment from Liftup, the Product will substantially conform to Liftup’s standard published specifications for the Product and the Product hardware will be substantially free from defects in materials and workmanship. The foregoing warranty shall not apply to embedded software/firmware components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Corporate Office:**
Liftup North America, Inc.
14928 Casey Rd
Tampa, Fl 33624
Denmark
Phone: +1 844 543 8878
www.liftup.us
- Manufacturer:**
Liftup A/S
Hagensvej 2 I
DK-9530 Stoevring
Phone: +45 9686 3020
www.liftup.dk

Supplier Contact:

Todd Rudley
Next Day Access, Westchester & Fairfield, NY
914-444-2103
Cell: 914-319-2623

- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.
- C. As a lift, the equipment is solely for the use of wheelchair users or persons with impaired mobility. The maximum load is 400 kg (880 lbs) evenly distributed on the platform (max. 2 persons).

2.2 TECHNICAL SPECIFICATIONS

- A. Specifications:

Power:	110 - 240 V/50 Hz (1.1A) Max: 90 W, Standby < 6 W	
Lifting capacity:	400 kg (880 lbs)	
Lifting height:	0 – 1250 mm	(0 – 49.21”)
Platform size:		
Internal dimensions:	W 700/800/900/1000 mm	(27.56/31.50/35.43/39.37”)
	L 900 mm - 1800 mm	(35.43 – 70.87”)
External dimensions:	W 930 – 1230 mm	(36.61 – 48.43”)
	L 1095 - 2010 mm	(43.13 – 79.13”)
Dead weight:	125 - 205 kg	(275.6 – 451.9 lbs)
Noise level:	<70 dB ^{1) 2)}	
Water and dust:	>50V: IP67 (Power Supply) / <50V: IP23 / <10V: IPxx	

Lifting speed/ temperature:	<u>°C</u>	<u>°F</u>	<u>mm/ second</u>	<u>inches/ second</u>
	+40°C - +5°C	+104°F - +41°F	<60 mm	<2.36"
	+5°C - -10°C	+41°F - +14°F	20 mm	0.79"
	-10°C - -20°C	+14°F - -4°F	10 mm	0.39"
Max. 200 kg/440 lbs	-20°C - -25°C	-4°F - -13°F	10 mm	0.39"
Approval:	Directive 2006/42/EC on machinery			
Duty cycle:	2 min. / 5 min.			
Battery capacity:	30 cycles at 25 °C. Fully charged = 5 hours			
Flat battery:	10 min. charge = 1 trip			

¹⁾ The noise level is an average, and for a short period noise will occur > 70 dB

²⁾ When "Raise-To-Fold" (RTF) has been activated in connection with ramp selection (option), the noise level is specified as up to 80 dB

B. All radio components comply with the following regulations and standards:

EU	2014/53/EU, Radio Equipment Directive (RED)
FCC (USA)	CFR 47 Part 15
DS/EN 62479:2010	Assessment of the compliance of low-power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)
DS/EN 300 440, v2.1.1	Short Range Devices (SRD); Radio equipment to be used in the 1 GHz to 40 GHz frequency range; (Electromagnetic compatibility and Radio spectrum Matters Draft)
DS/EN 301489-1, v2.2.0	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services, Draft
DS/EN301489-17, v3.2.0	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services
AS/NZS 4268	Radio Equipment and Systems –Short Range devices
AS/NZS 2772.2	Radio Frequency Fields (mean power <1 mW)

C. Internal receiver in FlexStep (MODULE1)

2.4 GHz Short Range devices. FCC ID: 2AK8H-MODULE1	
Receiver Class 3	
Dimensions (L x W x H):	72 x 33 x 10mm / 2,83 x 1,30 x 0,40 in.
Weight:	10 g (0,035 lbs.)
Frequencies:	2.410GHz 2.435GHz and 2.460GHz
Duty cycle:	< 1% (only TX for pairing Remotes)
Power:	< 0,6mW Controlled environment
Supply:	5,6 Volt 30mA
Water and dust:	IP XX (shall be mounted inside Liftup products)
Working temperature:	+5°C to +40°C/ 41°F to 104°F
Storage temperature:	-25°C to +70°C / 13°F to 158°F
Expected service life:	> 5 years

D. Handheld wireless remote control (REMOT1)

2.4 GHz Short Range devices. FCC ID: 2AK8H-REMOT1
 Receiver Class 3
 Dimensions (L x W x H): 96 x 47 x 24mm / 3,79 x 1,85 x 0,95 in.
 Weight: 48 g (0,11 lbs.)
 Frequencies: 2.410GHz 2.435GHz and 2.460GHz
 Duty cycle: < 1%
 Power: <0,6mW Controlled environment, Hold to run
 Battery: 3 Volt CR2032
 Water and dust: IP 42
 Working temperature: +5°C to +40°C / 41°F to 104°F
 Storage temperature: -25°C to +70°C / 13°F to 158°F
 Expected service life: > 5 years

E. Wall-mounted wireless call station (REMOT2)

2.4 GHz Short Range devices FCC ID: 2AK8H-REMOT2
 Receiver Class 3
 Dimensions (L x W x H): 170 x 72 x 42mm / 6.70 x 2.83 x 1.65 in.
 Weight: 180-215 g / 0,4-0,47 lbs.
 Frequencies: 2.410GHz 2.435GHz and 2.460GHz
 Duty cycle: < 1%
 Power: < 0,6mW Controlled environment, Hold to run.
 Battery: 3 Volt CR2032
 Water and dust: IP 54
 Working temperature: +5°C to +40°C/ 41°F to 104°F
 Storage temperature: -25°C to +70°C / 13°F to 158°F
 Expected service life: > 5 years

2.3 SAFETY INSTRUCTIONS

A. Installation and maintenance

1. Do not try to install or service your FlexStep yourself – this MUST be done by an authorized service technician. Do NOT remove the protective or safety plates, as this may lead to personal injury.

B. Unintended movements of FlexStep

1. If during the use of your FlexStep movement or action occurs which is not described in this manual, stop the unit and call technical assistance.
2. Should your FlexStep not move with plane movement as a platform, calibrate the lift by running the platform down to floor level. If the problem continues, call technical assistance.

C. Lift movement

1. The space under the lift must be kept free of all objects which may impair its downward movement. Otherwise the lift cannot be moved to the lowest level and thus not be used as a wheelchair lift.
2. Should an object hinder lift downward movement, the anti-crushing safety feature will be activated.

D. Avoiding personal injury

1. Do NOT transform the FlexStep from stairs into platform or the reverse when persons or objects are on the stairs.
So as to avoid personal injury it is NOT permitted to use the FlexStep V2 when someone is at risk of being injured by crushing, cutting, falling, slipping, or similar.
It is important that the operator/user ensures that the lift can move without putting anyone or anything at risk.
Be extra careful when there are small children, elderly or disabled people on or near the stairs/platform, as these groups cannot always be expected to be able to foresee the possible consequences of lift movement.

E. Overload of the lift

1. In order to avoid damage to the lift in the event of overload (max. 400 kg (880 lbs) evenly distributed), it is fitted with an overload cut-out, which when triggered halts the lift and issues an audible alarm. In such cases, run the lift down in order to exit it.

F. Personal safety

1. FlexStep is fitted with various safety features which ensure that the user or other people are not injured when using the lift.

WARNING! Although the lift comes fitted with various safety features never use it if persons or animals are close by, as there may otherwise be a risk of crushing.
Never allow children to play with the lift.

G. Anti-crushing

1. Beneath the entire lift a number of pressure plates (anti-crushing) are fitted which are activated if an object is going to be crushed below. When this feature is activated the lift stops and then runs approx. 2 cm upwards, while at the same time an audible alarm is issued.
2. If the anti-crushing feature is activated, release the operating button. Remove any objects under the lift, and it can then be run to the “lower landing” or “staircase” states. (If needed, run the lift upwards so you can more easily remove objects underneath it).

IMPORTANT! Keep in mind that when the lift is used outside, leaves, branches and snow can affect the anti-crushing safety feature, and so you should check regularly that the lift will not be obstructed when moving downward.

3. Infrared anti-crushing feature
 - a. Infrared sensors are fitted between the steps in order to avoid crushing between them.

4. If the IR sensors are disrupted when the FlexStep V2 moves from staircase to platform or the reverse, movement will stop, and an audible alarm will sound.

H. Safety Barriers

1. Ramp as roll-off protection
 - a. If the lift is fitted with a ramp, the ramp will first pull up and lock before the lift begins to move. The ramp now acts as roll-off protection. When the lift returns to floor level, the ramp will automatically lower (keep the button pressed) and act as a drive-on/drive-off ramp.
2. Doors as roll-off protection
 - a. If the lift is fitted with doors, they will close before it begins to move. The doors will always be closed, when the lift has moved off ground level. If the lift is fitted with doors, it can be equipped with automatic door locks. The automatic door locks will secure that the doors are locked before the lift begins to move.
3. Vertical safety barrier
 - a. If the lift is fitted with a vertical safety barrier (optional equipment) at the upper level, it will close before the lift begins to move. The vertical safety barrier will always be closed, when the lift is not at the upper level.

I. Handling

1. The lift is normally supplied by your dealer, who also takes care of installation. Do not try to move the lift manually, as this can lead to personal injury. The product should be moved and handled using suitable lifting equipment (pallet-truck, roller plate, or similar).
2. Do not subject the lift to severe knocks/blows as these can affect functionality.
3. Keep the associated remote control (optional equipment) dry and do not subject it to severe blows. Cleaning may only be performed using a well-wrung cloth.

J. Lifts accessible to the public (only certain countries)

1. If the lift is accessible to the public, basically it must be equipped with a key switch, ensuring that the lift can be locked when left unobserved.
2. In order to make sure that persons cannot unintentionally be trapped in the lift, it must be possible to lock it so that it is not possible to access the lift (in a normal manner). The key switch shall prevent the lift from moving and ensure that doors may be closed or locked. If the lift is not under observation or locked, but the owner (or his representative) is present close to the building, it must be equipped with an alarm signal for calling for help.
3. If the lift is equipped with an alarm signal, the signal must be connected to an external alarm device (e.g. light, sound or similar) which can draw attention to the need for assistance at the lift. If the lift is installed in such a way that an alarm signal is insufficient (e. g. freely accessible without observation), a two-way communication system must be installed.
4. If the lift is installed with a two-way communication system, it must be connected to a telephone number which is in operation at any time (when the lift is accessible),

K. Emergency lighting

1. In the event of power failure or if power to the control system gets disconnected for some other reason, the system will automatically switch to backup mode. This means that the system will continue to work, as the lift will then be powered by a backup battery. The illuminations on the operating panel will still be alight.

2.4 FUNCTIONALITY

- A. The lift is a so-called “hold-to-run” device, i.e. the buttons must be pressed and held for the entire motion.
- B. The lift works simply by the user calling it by pressing one of the buttons on the wall, or by using the associated remote control (optional equipment). When the user is on the platform it is operated by means of a side panel, from which the user can choose between moving to the top or bottom level.

2.5 ASSEMBLY

- A. The lift is installed by an authorized service technician. Do not attempt to transport/move or uninstall your FlexStep, or to repair it. These actions MUST be undertaken by an authorized service technician.
- B. Improper assembly can pose risks to user personal safety. Liftup disclaims any liability if assembly and installation are not performed by an authorized service technician.

2.6 START-UP

- A. FlexStep V2 should always be connected to a 230 V power socket and be switched on. Normally the lift is in constant stand-by mode, i.e. it is ready for use as soon as one of the operating buttons is pressed.
- B. If the emergency stop is pressed in – or the lift is switched off by a key switch (optional equipment) – it must be released before the lift can be put into use.

2.7 INSTRUCTIONS FOR THE USE

- A. The FlexStep is a unique 2-in-1 application designed to function both as an ordinary staircase and as a wheelchair lift. Basically, the FlexStep V2 is an ordinary staircase, but with the simple pushbuttons it is easily folds up/down to a platform and is transformed to a wheelchair lift.

2.8 DAILY USE

- A. FlexStep is operated by means of two operating panels: Standard, FUGA or key-operated call stations at the top and bottom levels respectively, pushbuttons on the lift or by using the remote control (optional equipment). The remote control replaces the two operating panels. Additionally,

the lift can be switched on or off by means of a key switch (optional equipment). (Reference user manual)

B. Operating FlexStep from the TOP level

1. In order to call the stairs to a platform at the TOP level press and hold the button with the UP arrow (Δ/\uparrow). The stairs lift the ramp into an anti-roll-off barrier, and this is then locked in the raised position. The stairs move down into a platform at the BOTTOM level, which then rises to the TOP level. Drive carefully onto the platform (use the wheelchair brake), press the DOWN arrow on the operating panel (∇/\downarrow), and the platform will sink to the BOTTOM level. Now the anti-roll-off barrier will lower and act as a ramp. Drive carefully off the platform.

C. Operating FlexStep from the BOTTOM level

1. In order to call the stairs to a platform at the BOTTOM level, press and hold the bottom button with the DOWN arrow (∇/\downarrow). The stairs lift the ramp into an anti-roll-off barrier and this is then locked in the raised position (Fig. 1). The stairs move down into a platform at the BOTTOM level, after which, the anti-roll-off barrier lowers into an access ramp. Drive carefully onto the platform (use the wheelchair brake). Press the UP arrow (Δ/\uparrow) on the operating panel, and the platform will rise to the TOP level after the ramp has risen into an anti-roll-off barrier. Drive carefully off the platform.

D. Operating FlexStep on the platform

1. The lift is operated as a wheelchair lift by means of an operating panel fitted to the stair handrails. The platform panel only functions when FlexStep is in a platform state. An assistant can also run the platform up or down using the operating panels on the wall or the remote control.
 - a. To run the platform up, press and hold the UP arrow (Δ/\uparrow) until the lift stops and any door or safety barrier has opened.
 - b. To run the platform down, press and hold the DOWN arrow (∇/\downarrow) until the lift stops and the ramp has lowered to the floor.

E. Return to stairs and auto return

1. By activating the button with the stairs symbol, FlexStep transforms back to its normal state, which is staircase.
2. If no operating buttons or IR sensors have been activated for approx. 60 seconds (standard setting), FlexStep will automatically return to its normal state of staircase. An audible alarm will sound during this process. This function can be disconnected if the user does not want the lift to automatically revert to stairs.
3. LIFTUP recommends that the auto-return function is turned off in all cases when there is no safety at the top level.

F. Emergency stop

1. Should the lift make an unintended movement, or if it needs to be stopped in order to avoid injury, press the EMERGENCY STOP. To release the emergency stop, turn the button clockwise and then the system is again ready for use.

G. ON/OFF switch

1. FlexStep comes fitted with an ON/OFF switch. It is sited at the base of the control box on the right-hand side. This button is used to disconnect the power supply to the lift. If the user switches this off at the same time as activating the emergency stop, the lift will be completely powered off.
2. The ON/OFF switch is used in connection with service inspections. Power to the lift is switched on/off by activating the ON/OFF switch and the emergency stop. When power is again returned to the lift (and emergency stop is released), the control system restarts. Normally it is ON so as not to ruin the batteries.
3. **WARNING!** The ON/OFF switch is for the battery charger. It is not the mains switch. If it set to OFF for a longer period of time, it may drain and damage the batteries. In the event of a long-standing power outage, the emergency stop should be activated to ensure that the batteries are not completely discharged.

H. Audible alarms

1. If no “speak” is installed on the lift, an alarm tone will sound.

I. Emergency alarm devices (optional equipment)

1. The lift can be equipped with a two-way intercom system which allows the user to contact external assistance in case of an emergency. To activate the alarm press and hold the alarm button (🔊) for 5 seconds.

2.9 OPERATION

- A. Under normal operating conditions the lift shall always be connected to a 230 V power socket. It is very important that the power is not disconnected or switched off as long-standing power outage (10-20 hours) may result in flat batteries and thus inoperability. Thus, the lift cannot be used until the batteries have been recharged. An audible alarm will sound if the power supply is interrupted.

B. Battery backup

1. In the event of power failure or if power to the control system gets disconnected for some other reason, the system will automatically switch to backup mode. This means that the system will continue to work completely normally as power to the lift is supplied by a backup battery. An audible alarm will sound in the event of power failure. This alarm will cease as soon as power is returned to the lift. The system is again running in normal operating mode. However, should it not be possible to immediately supply power and you wish to stop the alarm, press the emergency stop. (Be aware that the system will now need calibrating – see below).
2. **IMPORTANT!** If the 230 V power supply has been disconnected and the emergency stop activated at the same time, the system will automatically switch to “safety mode” and will then need calibrating (see below).

C. Calibration following emergency stop/power failure

1. The lift will require calibration if the emergency stop has been activated and the power supply interrupted, or if the system registers some other type of irregularity. The lift

automatically goes into a special “safety mode” which only permits slow speed downward movement.

2. **IMPORTANT!** If you notice the lift not working as expected or if it stops after only a few centimetres, technical problems may have arisen which require attention by technically qualified personnel. Contact your dealer for further assistance.

2.10 MAINTENANCE

- A. Clean the lift by wiping with a well-wrung cloth using water mixed with a mild detergent.
 1. **IMPORTANT!** Do NOT use a high-pressure jet or rinse the lift directly using a hose. Do not use aggressive cleaning agents or similar on the lift, and avoid salt or sand coming into contact with the lift in connection with winter maintenance.
 2. Any oiled wooden surfaces are to be regularly maintained (approx. every 3 months) with wood oil in order to ensure wood service life. Varnish according to need.
 3. Check beneath the lift regularly for any leaves, branches or other objects and remove these in order to ensure free movement.
 4. The mechanical maintenance of the lift shall normally only be undertaken in connection with the regular service inspections. These are to be performed by an authorized service technician.
 5. Should unexpected errors or jarring sounds occur, contact your dealer at once.
- B. Remote controls
 1. A CR2032 battery is installed in the remote controls (optional equipment).

2.11 HOW TO PAIR THE TRANSMITTER AND RECEIVER

- A. Remote control and receiver 2.4 GHz
The transmitter and receiver must always be paired in order to work. This is normally done at the factory or by an authorized service technician. The receiver will not react to a transmitter which is not paired with it. A receiver can be paired with up to 20 transmitters. A transmitter can be paired with several receivers, if required.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify required supports are correct.
- C. Verify electrical rough-in is at correct locations.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install FlexStep lifts in accordance with in compliance with regulatory requirements specified and the manufacturer's instructions.
- B. Install system components and connect to building utilities.
- C. Accommodate equipment in space indicated.
- D. Startup equipment in accordance with manufacturer's instructions.
- E. Adjust for smooth operation.

3.4 FIELD QUALITY CONTROL

- A. Perform tests in compliance with regulatory requirements specified and as required by authorities having jurisdiction.
- B. Schedule tests with agencies and Architect, Owner, and Contractor present.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 14 42 16

SECTION 03 11 00 - CONCRETE FORMWORK FOR SWIMMING POOL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Furnish and install forms for shotcrete swimming pool construction.

1.2 RELATED WORK

- A. Section 03 21 00 - Concrete Reinforcement for Swimming Pool
- B. Section 03 37 13 - Shotcrete for Swimming Pool
- C. Section 07 92 00 - Waterstops and Sealants for Swimming Pool
- D. Section 13 11 00 - Summary of Work for Swimming Pool
- E. Division 26 - Electrical

1.3 REFERENCES

- A. American Concrete Institute (ACI)
 - 1. ACI 301 - Standard Specifications for Structural Concrete
 - 2. ACI 347 - Recommended Practices for Concrete Formwork
 - 3. ACI 506R - Guide to Shotcrete
- B. U.S. Army Corps of Engineers (CE)
 - 1. CE 03300 - Cast-in-Place Concrete

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Forms for exterior and interior surfaces which will be exposed to view after the work is completed, whether such surfaces are painted or unpainted, shall be new plywood stock, steel, tempered Masonite, or other materials which will provide smooth concrete surfaces without subsequent surface plastering. Plastic or plastic faced forms shall not be used, except with the prior approval of the Engineer.
- B. Form ties shall be cone type or equal, with waterstop, which leaves no metal closer than 3 inches to finished face of concrete.
- C. Form release agent shall be a non-staining, non-yellowing, non-toxic liquid free from kerosene and resins of the type recommended by the manufacturer of the forming system being used such as:
 - 1. L&M EZ STRIP manufactured by LATRICRETE International, Inc., Bethany, CT
 - 2. Magic Kote manufactured by Dayton Superior Corporation, Miamisburg, OH
 - 3. V-Release manufactured by SpecChem, LLC, Kansas City, MO
 - 4. Or approved equal

- D. Where steel adjacent to vertical faces of forms cannot be otherwise secured, mortar doughnuts shall be used to prevent steel from lying too close to the finish vertical faces of the concrete.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surfaces of forms to be in contact with concrete shall be greased with non-staining form release compound. Wetting will not be accepted as a substitute. Approval of the Engineer shall be obtained before use of coated materials or liners in lieu of form release compound, except as modified herein.

3.2 CONSTRUCTION

- A. For concrete surfaces which will be visible after completion of the structure, painted or unpainted, the type and the precise location of form ties, nails joints between form members, and any other features which will leave a visible trace in the finished concrete, will be subject to the approval of the Engineer.
- B. Formwork shall be so constructed, braced, or tied that the formed surfaces of the concrete will be perfectly true, smooth, and to the dimensions shown on the drawings. All forms used for circular sections shall be true arcs as indicated on the contract drawings. Short chords will not be acceptable. Form line shall present an uninterrupted surface conforming to radii indicated on the drawings.
- C. Forms shall be sufficiently tight to prevent leakage of mortar, and when necessary, shall have temporary openings as required for thorough cleaning, and as required for introduction of concrete to avoid excessive free fall. Panels damaged in stripping or otherwise shall not be reused.
- D. Unless otherwise noted on the design drawings, forms shall be filleted and chamfered at all sharp corners and exposed edges with a 3/4-inch chamfer. Chamfer shall not be used where masonry or other material will subsequently be installed flush with one of the adjacent surfaces of the concrete. Where a wash or slope is indicated on the drawings no additional chamfer is required.

3.3 REMOVAL OF FORMS

- A. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has attained a strength of at least 30 percent of the ultimate strength prescribed by the design and not before reaching the following number of day-degrees, whichever is the longer:

Forms for	Day-Degree *
Beams and Slabs	500
Walls and Vertical Surfaces	200
* Day-Degree: Total number of days times average daily air temperature at surface of concrete. For example, 5 days at a daily weighted average temperature of 60 degrees Fahrenheit equals 300 day-degrees. Temperatures below 50 degrees Fahrenheit are not to be considered in determining Day-Degree.	

- B. Where beams, girder, columns, walls, and similar vertical forms are adequately supported on shores, the side forms may be removed after 24 hours of cumulative curing time provided the side forms support no loads other than the lateral pressure of the plastic concrete. Cumulative curing time represents the sum of time intervals, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50 degrees Fahrenheit in accordance with American Concrete Institute standards.

- C. Shoring shall not be removed until the concrete has attained at least 70 percent of the specified strength and sufficient strength to support safely its own weight and the construction live loads upon it.
- D. Forms shall be removed in such a manner as not to impair safety and serviceability of the structure. Concrete exposed by form removal shall have sufficient strength not to be damaged by the removal operation.

END OF SECTION 03 11 00

SECTION 03 21 00 - CONCRETE REINFORCEMENT FOR SWIMMING POOL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Furnish and install reinforcement for shotcrete swimming pool construction.

1.2 RELATED WORK

- A. Section 03 11 00 - Concrete Formwork for Swimming Pool
- B. Section 03 37 13 - Shotcrete for Swimming Pool
- C. Section 07 92 00 - Waterstops and Sealants for Swimming Pool
- D. Section 13 11 00 - Summary of Work for Swimming Pool
- E. Division 26 - Electrical

1.3 SYSTEM DESCRIPTION

- A. Materials and construction shall conform to ACI 318 and ACI 350 unless otherwise noted on the contract drawings or modified herein.

1.4 SUBMITTALS

- A. The Contractor shall furnish the Engineer with complete checked, reinforcing steel shop drawings and bar schedule. Shop drawing shall include grade of steel used as well as splice lengths.
- B. Mill test reports shall accompany shop drawings. Fabrication shall not commence until the shop drawings and mill test reports have been released by the Engineer.
- C. When fiber reinforcement is used, contractor shall submit manufacturer's data confirming that material meets the specification.

1.5 REFERENCES

- A. American Concrete Institute (ACI)
 - 1. ACI 318 - Building Code Requirements for Concrete
 - 2. ACI 347 - Recommended Practice for Concrete Formwork
 - 3. ACI 350 - Environmental Engineering Concrete Structures
 - 4. ACI SP-66 - ACI Detailing Manual
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM A185 - Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement
 - 2. ASTM A497 - Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement

3. ASTM A615 - Deformed Billet Steel Bars for Concrete Reinforcement
 4. ASTM A775 - Epoxy-coated Reinforcing Steel Bars
 5. ASTM A884 - Epoxy-coated Welded Wire Fabric
- C. American Welding Society (AWS)
1. AWS 12.1 - Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel reinforcing bars shall conform to ASTM A615, Grade 60, and A775 if epoxy-coated bars are specified.
- B. Welded steel wire fabric shall conform to ASTM A185 or ASTM A497 and ASTM A884 if epoxy-coated fabric is specified. Gauge and spacing of wires shall be as indicated on the drawings.
- C. Reinforcing steel shall be detailed in accordance with ACI SP-66 modified as applicable to conform to ACI 350.
- D. Reinforcement shall be accurately formed to the dimensions indicated on the drawings. Bars shall be shipped to the site with bars of the same size and shape, fastened in bundles with securely wired on metal identification tags listing both size and mark.
- E. Any bar showing cracks after bending shall be discarded.
- F. Steel failing to meet the requirements of this specification or the contract drawings will be rejected and shall be removed from the site immediately.

PART 3 - EXECUTION

3.1 STEEL INSTALLATION

- A. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt, and other coatings (including ice), that reduce or destroy bond. When there is a delay in depositing concrete after reinforcement is in place, bars shall be reinspected and cleaned as necessary.
- B. After forms have been oiled, but before concrete is placed, all steel shall be securely wired in the exact position called for and shall be maintained in that position until all concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Engineer.
- C. Concrete blocks having a minimum bearing area of 2-inches by 2-inches and equal in quality to that specified for the slab, shall be used for supporting reinforcing bars for slabs on grade. Wood blocks, stones, brick chips, etc., shall not be used to support reinforcement.
- D. Metal supports shall be of types that will not penetrate the surface of formwork or slab and which will not show through or stain surfaces that are to be exposed to view, painted or unpainted.

- E. Welding of reinforcing bars will be permitted only where permission of the Engineer has been obtained in advance. Such welding shall be performed only under conditions established by the Engineer, and in accordance with AWS 12.1.
- F. Reinforcement, which is to be exposed for a considerable length of time after having been placed, shall be painted with a heavy coat of cement grout, if required by the Engineer.

END OF SECTION 03 21 00

SECTION 03 30 01 - CAST-IN- PLACE CONCRETE FOR SWIMMING POOL

PART 1 - GENERAL

1.1 WORK INCLUDED:

- A. The work of this Section consists of all plain and reinforced concrete work as shown on the drawings and as specified herein, and includes, but is not limited to the following:
1. Furnishing, placing, curing and finishing of all plain and reinforced concrete work for the pool floor, pool walls, pool surge tanks, pits, footings and supports, where indicated.
 2. Furnishing, erection and removal of formwork.
 3. Furnishing and placing of reinforcing steel and related accessories.
 4. Furnishing and installation of vapor barrier, where indicated.
 5. Furnishing and installing concrete grout for pool, gutter, fittings and anchors.
 6. Furnishing and installation of joint fillers.
 7. Setting of anchor bolts and grouting of leveling plates and bearing plates.
 8. Coordination with all other trades for locating of all pipe sleeves, duct openings, keys, chases, electrical boxes and conduits, anchors, inserts, fastenings and other devices required by other trades.
 9. Hardening of exposed concrete surfaces, where indicated.
 10. Concrete finish shall be acceptable of the proposed pool finish.
- B. Install the following items furnished by other Sections:
1. Anchor bolts, embedded plates with bolts or anchors as indicated.
 2. Dovetail anchor slots, as indicated.

1.2 RELATED WORK:

1. The following items of related work are specified and included in other Sections of this Specification:
 - Section 03 11 00, CONCRETE FORMWORK FOR SWIMMING POOL
 - Section 03 21 01, CONCRETE REINFORCEMENT FOR SWIMMING POOL
 - Section 07 92 01, WATERSTOPS AND SEALANTS FOR SWIMMING POOL
 - Section 09 34 13, SWIMMING POOL TILE
 - Section 13 11 00.16, SWIMMING POOL EQUIPMENT
 - Section 31 00 00, EARTHWORK

1.3 QUALITY ASSURANCE:

- A. All materials, measuring, mixing, transportation, placing and curing shall be subject to inspection by the Engineer or by the testing agency. However, such inspection, wherever conducted, shall not relieve the Contractor of its responsibility to furnish materials and workmanship in accordance with Contract requirements, nor shall inspector's acceptance of material or workmanship prevent later rejection of same by the Owner or Engineer if defects are discovered.
- B. The Contractor shall retain the services of a qualified testing agency, approved by the Engineer, to test aggregate and to prepare or review mix designs for each strength of concrete specified, and shall submit mix designs and test results to the Engineer for approval. The cost of all such preliminary services shall be borne by the Contractor.
- C. Field Test to be paid by Contractor.
- D. Advise the testing agency of intent to place concrete by notification at least 24 hours to the time of placement.
- E. Concrete will be sampled and tested for quality control as follows:
1. Sampling fresh concrete: ASTM C 172
 2. Compression test specimens: ASTM C 31
 3. Slump: ASTM C 143

4. Air content: ASTM C 231
 5. Compressive strength: ASTM C 39
- F. Cooperate with the testing agency's work and provide help as required for taking and storing samples. Provide storage facilities for concrete cylinders at the site. Facilities must protect cylinders from effects of low or high temperatures in cold or hot weather, respectively.
 - G. Compression tests shall consist of four (4) cylinders for each test made, cured and tested by the laboratory during the progress of the job. At least one (1) test shall be made for each strength of concrete up to 50 cubic yards pour, and at least one (1) test per strength for each 50 cubic yards thereafter. Unless otherwise approved by the Engineer. Concrete for each set of cylinders shall be from one (1) sample representative of the entire batch. All cylinders shall be standard (6-inches by 12-inches).
 - H. Compression tests shall occur at day three, seven, fourteen and twenty-eight.
 - I. When tests of control specimens fall below required strength, the Engineer may require core specimens taken from concrete in question and tested in accordance with ASTM C 42. If these specimens do not meet strength requirements, Engineer will have right to require additional curing, load tests, strengthening or removal and unacceptable, and in addition, removal of such sound portions of structure as necessary to ensure safety, appearance, and durability of the structure. Additional testing, load tests, strengthening or removal and replacement of parts of structure shall be at the Contractor's expense.
 - J. Testing required because of changes requested by the Contractor in materials, sources of materials or mix portions and extra testing of concrete or materials because of failure to meet the Specification requirements is to be paid by the Contractor.
 - K. In addition to the forementioned requirements of this subpart, the Owner reserves the right to engage a qualified testing agency for additional testing and inspection. Such testing will be paid directly by the Owner.

1.4 NOTIFICATION OF RELATED TRADES:

- A. Notify all other trades responsible for installing chases, insets, sleeves, anchors, louvers, etc., when ready for such installation, and for final checking immediately before concrete is placed. Cooperate with such trades to obtain proper installation.
- B. Leave openings in walls for pipes, ducts, etc., for mechanical and electrical work, as shown on Drawings or required by layout of mechanical systems.

1.5 QUALIFICATIONS OF CONCRETE CONTRACTOR:

- A. Experience Qualification: Work shall be performed by or under direct supervision of Contractor with five years (5) experience in construction and equipping of public pools. Submit a list of five (5) projects, completed within the last two (2) years, for which swimming pool contractor was responsible for equipping of concrete, similarly equipped pools for public use.
- B. Installation of Pool System and Equipment: Pool equipment and system shall be installed by specialists, experienced in swimming pool work and licensed or approved by manufacturer to ensure installation and performance in accordance with manufacturer to ensure installation and performance in accordance with manufacturer's warranties and guarantees.

1.6 REFERENCES:

- A. The following standards are a part of these specifications as referenced:
 1. American Concrete Institute (ACI)
 - a. ACI 301 Structural Concrete for Buildings
 - b. ACI 302 Recommended Practice for Concrete Floor and Slab Construction
 - c. ACI304 Recommended Practice for Measuring, Mixing, Transporting and Replacing Concrete
 - d. ACI 305.1 Specification for Hot Weather Concreting

- e. ACI 306.1 Standard Specification for Cold Weather Concreting
 - f. ACI 318 Building Code Requirements for Reinforced Concrete
 - g. ACI 347 Recommended Practice for Concrete Formwork
 - h. ACI 350 Concrete Sanitary Engineering Structures
 - i. ACI 350.1 Tightness Testing of Environmental Engineering Concrete Containment Structures
2. ASTM International (ASTM)
- a. ASTM C33 Concrete Aggregates
 - b. ASTM C39 Compressive Strength of Cylindrical Concrete Specimens
 - c. ASTM C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
 - d. ASTM C87 Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
 - e. ASTM C94 Ready-Mixed Concrete
 - f. ASTM C143 Standard Method for Slumps of Portland Cement Concrete
 - g. ASTM C150 Portland Cement
 - h. ASTM C171 Sheet Materials for Curing Concrete
 - i. ASTM C231 Air Content of Freshly Mixed Concrete by the Pressure Method
 - j. ASTM C260 Air-Entraining Admixtures for Concrete
 - k. ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete
 - l. ASTM C494 Chemical Admixtures for Concrete
 - m. ASTM D1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
 - n. ASTM D1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
 - o. ASTM D4832 Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders
 - p. ASTM D5791 Standard Practice for Sampling Freshly Mixed Controlled Low Strength Material (CLSM)
 - q. ASTM D6023 Standard Test Method for Unit Weight, Yield, Cement Content, and Air Content (Gravimetric) of Controlled Low Strength Material (CLSM)
 - r. ASTM D6024 Standard Test Method for Ball Drop on Controlled Low Strength Material (CLSM) to Determine the Suitability of Load Application
 - s. ASTM D6103 Standard Test Method for Flow Consistency of Controlled Low Strength Material (CLSM)
3. Concrete Reinforcing Steel Institute (CRSI).
- a. CRSI Manual of Standard Practice

- B. In case of conflict between the References and the Project Specification, the Project Specification shall govern. In the case of conflict between References, the more stringent shall govern.
- C. When compliance with any such References is specified herein for materials or a manufactured or fabricated product, the Contractor, if requested, shall furnish an affidavit from the manufacturer or fabricator certifying that the materials or product delivered to the job meets the requirements specified. However, such certification shall not relieve the Contractor from the responsibility of complying with any added requirements specified herein.

1.7 SUBMITTALS:

In accordance with the General Specifications, submit the following:

- A. Submit complete shop drawings and data for the Engineer's approval.
- B. Provide submittals for fabricating and placing reinforcing steel. Show all required information for cutting, bending and placing reinforcing bars and show all accessories and support bars on placing drawings. Indicate suitable marks for placing bars.
- C. Provide submittals of forms for exposed round columns and architecturally exposed concrete, showing layout of joint patters and exposed cone recesses at wall ties.

- D. Provide concrete Mix Data as specified in Part 2.02B – air-entraining agent shall conform to ASTM C 260.
- E. Provide manufacturer’s data for other products, which are considered for use.
- F. Fabrication of any material or performing of any work prior to the final approval of the submittals will be entirely at the risk of the Contractor.
- G. The Contractor is responsible for furnishing and installing materials called for in the Contract Documents, even though these materials may have been omitted from approved submittals.

1.8 DELIVERY, STORAGE AND HANDLING:

- A. All materials shall be stored to prevent damage from the elements and other causes.
- B. Cement and aggregates shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter. Any materials which have deteriorated, or which have been damaged, shall not be used for concrete.
- C. Store reinforcement steel on wood skids to protect it from earth and damage from trucking or other construction operations. Reinforcement shall be free from loose mill scale, rust, release agent, concrete splatter and other extraneous coatings at the time it is embedded in the concrete.
- D. All forms shall be stored in a neat manner and orderly fashion, protected from the weather and abuse.
- E. Materials, which are judged not acceptable for this project, shall not be stored on site, but shall be immediately removed from the site.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Cement shall be Portland Cement conforming to ASTM C 150, Type II.
- B. Water shall be from the local municipal supply.

2.2 ADMIXTURES:

- A. Water-reducing agent shall conform to ASTM C 494, Type A. Water-reducing agent shall be compatible with air-entraining agent.
- B. Air-entraining agent shall conform to ASTM C 260.
- C. Calcium Chloride or admixtures containing more than 0.1% Chloride ions are not permitted.

2.3 AGGREGATES:

- A. Coarse Aggregate shall be hard, durable, uncoated crushed stone or gravel conforming to ASTM C 33. Coarse aggregate shall pass through ¾-inch sieve except 3/8-inch at toppings less than 3-inches thick.
- B. Fine Aggregate shall be sand, clean, hard, durable, uncoated grains, free from silt, loam and clay, to meet ASTM C 33.

2.4 FORM WORK:

- A. Forms for exposed round columns shall be seamless unless otherwise approved by the Engineer. Forms shall be lined so as to produce a smooth, hard concrete finish free of lines, spirals or indentations upon removal. Where surface is being painted, concrete shall be finished to smooth surface, acceptable for paint.
- B. Forms for concrete surfaces not exposed to view in finished work shall be made of wood, metal or other material subject to approval of Engineer.
- C. Form release agent shall be of a non-staining type, specifically manufactured for concrete forms.
- D. Form Ties shall be factory-fabricated, removable or snap back of approved design. Wire shall be at least 1-½-inches back from exterior surfaces and 1-inch from interior surfaces. Furnish with removable wooden

or plastic cones of approved sizes where called for, with waterproof stop at exposed Architectural concrete surfaces. When concrete wall will be exposed to pool water, form ties must be epoxy coated.

2.5 SURFACE CONDITIONERS:

- A. Joint filler when used with caulking or sealants, shall be cork type, non-extruding, self-expanding filler strips conforming to ASTM D 1752, III. Where no sealant or caulking is required, strips may be non-extruding bituminous type in accordance with ASTM D 1751.
- B. Where a vapor barrier is specified, it shall be 0.006-inch polyethylene film.
- C. Where perimeter insulation is specified it shall be extruded polystyrene foam “Styrofoam Brand Tongue and Groove” by Dow Chemical, or equal approved by Engineer. Molded bead polystyrene is not permitted.
- D. Non-Shrink Grout: Shall be ‘Masterfloor 713’ by Master Builders, ‘Sono Grout’ by Sonneborn Contech, Inc. ‘Five Star Grout’ by U.S. Grout Corporation or equal approved by the Engineer.

2.6 JOINT SEALANT:

- A. Joint sealant for construction and control joints shall be a two-part polysulfide base sealant conforming to Thiokol's Building Trade Performance Specification, Class A (self-leveling), Type II (hardness: 35-45 Shore A), or as by BASF Inc., D.H. Harris, or approved equal.
- B. Contractor shall refer to Specification Section 07 92 01 - Waterstops & Sealants for Swimming Pool for joint sealants to be used within the proposed pool shell for pool walls, pool slabs and gutter to pool wall joints.

2.7 CONCRETE MIXES:

- A. Strength requirements:
 - 1. Deck, footings, ballast slab, pool and tank shall have a minimum compressive strength of 4,500 psi at 28 days.
- B. All concrete shall be proportioned in accordance with ACI Standard 211.1, “Recommended Practice for Selecting Proportion for Normal and Heavyweight Concrete” and comply with the requirements of ACI 301, “Specifications for Structural Concrete” Chapter 3, Method 1 (trial batches) or Method 2 (field experience).
- C. Air-entraining and water-reducing agents shall be used in all concrete, in strict accordance with the manufacturer’s printed instructions. Total air entrained in freshly mixed concrete shall be five percent (5.0%) plus or minus one percent (1.0%) of volume of concrete with required strengths maintained, except that all interior slabs subject to abrasion shall have a maximum air content of three percent (3%) and at swimming pool/surge tank which shall have six percent (6%) air content.
- D. Water: Cement Ratio – All concrete subjected to freezing and thawing shall have a maximum water-cement ratio of 0.5 by weight. All concrete required to be watertight and/or subjected to groundwater shall have a maximum water-cement ratio of 0.45 by weight. This is total water in mix at time of placement, including free water of aggregates and liquid admixtures.
- E. Slump of concrete:
 - 1. Footings: 4-inches
 - 2. Slab-on-grade: 3-inches
 - 3. Slab-on-metal forms: 3-inches
 - 4. Reinforced slabs, beams, walls, columns, and parapets: 4-inches
- F. Pre-mix admixtures in solution form and dispense as recommended by the manufacturer. Include the water in the solution in the design water content of the mixtures.

PART 3 - EXECUTION

3.1 SUBGRADE:

- A. The subgrade for the walk shall be shaped to a true surface conforming to the proposed slope of the walk, thoroughly rolled at optimum moisture content and tamped with a power roller weighing not less than one (1) ton and not more than five (5) tons. All depressions occurring shall be filled with suitable material and again rolled or tamped until the surface is smooth and hard.

3.2 BASE:

- A. After the subgrade has been prepared as herein before specified, a base of free-draining gravel borrow, at optimum moisture content, shall be placed upon it and shall be thoroughly rolled by a power roller and tamped. The gravel base shall be at least as thick as indicated below and parallel to the proposed finished surface as shown on the plans.

3.3 FORMING:

- A. Acceptable tolerances shall be as specified in ACI 347 "Recommended Practice for Concrete Formwork".
- B. Swimming pool tolerances shall be Length: 0-inch minus, ½-inch plus, depth: 1-inch minus, 2-inch plus. Vertical end walls straight and true to a tolerance of ½-inch to a depth of 3-feet.
- C. Forms shall be constructed to conform to shapes, lines, and dimensions shown, plumb and straight, and shall be maintained sufficiently rigid to prevent deformation under load. Forms shall be sufficiently tight to prevent the leakage of grout. Securely brace and shore forms to prevent displacement and to safely support the construction loads.
- D. Treat forms with a form release agent applied according to the manufacturer's instructions, by roller, brush or spray to produce a uniform thin film without bubbles or streaks. Apply the release agent in two coats for the first use of the form and in one coat for each additional use.

3.4 MIXING PROCESS:

- A. Ready-mixed concrete shall be mixed and transported in accordance with "Specification for Ready-Mixed Concrete" ASTM C 94, and ACI 304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".

3.5 REINFORCING:

- A. Reinforcing shall be securely tied and supported to maintain proper spacing and minimum 3-inches cover during placing operations. Take particular care to bend tie wire ends away from exposed faces of beams, slabs and columns. In no case shall ends of tie wires project towards or touch formwork.

3.6 EMBEDDED ITEMS:

- A. Coordinate the installation of all embedded items required by all trades. Such items normally are to be in place prior to the placing of reinforcing steel.

3.7 EXPANSION JOINTS:

- A. Expansion joints shall be located as shown on the plans and details and as required by the Engineer.

3.8 JOINTS:

- A. Provide construction joints as shown on the Drawings, but in any case limit the maximum dimensions for placement of concrete in any one placement as follows:
 - 1. Walls: 75 Feet
 - 2. Reinforced Slabs, beams: 100 Feet

3. Slabs-on-grade: 100 Feet
 4. Slabs-on-metal forms: 100 Feet
- B. Construction joint shall be formed with Keyed bulkheads. Reinforcement shall continue through the joint and additional reinforcement shall be placed as indicated on the Drawings.
 - C. Provide control joints as shown on the Drawings, but in any case, limit the maximum dimensions between joints as follows:
 - D. Slabs-on-grade: 30 times the slab thickness.
 - E. Control joints shall be saw cut or as approved by Engineer. Reinforcement shall continue through the joint.
 - F. All joints in the swimming pool/surge tank shall be made with keyways and waterstops.
- 3.9 PLACING:
- A. Notify Engineer at least 24 hours prior to each placement.
 - B. Do not place concrete until soil bearing material, reinforcing steel, inserts, sleeves and other work to be built into the concrete have been inspected and approved by the Engineer and all trades concerned.
 - C. In hot weather, all concreting shall be done in accordance with ACI 305.1 "Specification for Hot Weather Concreting".
 1. When temperature rises above seventy degrees Fahrenheit (70° F), all surfaces of concrete shall be protected against rapid drying.
 2. Concrete delivered to the forms shall have a temperature of not over 90 degrees F.
 3. The temperature of the forms shall not be over ninety degrees Fahrenheit (90° F).
 4. Use ice as part of mixing water in massive concrete elements.
 - D. In cold weather, all concreting shall be done in accordance with ACI 306.1, "Specification for Cold Weather Concreting".
 1. When the average daily temperature falls below forty degrees Fahrenheit (40° F), all surfaces of concrete shall be maintained at a temperature of at least fifty degrees Fahrenheit (50° F) and not over ninety degrees Fahrenheit (90° F) for seven (7) days.
 2. Concrete delivered to the forms shall have a temperature of at least sixty degrees Fahrenheit (60° F) and not over ninety degrees Fahrenheit (90° F).
 3. The temperature of the forms including gravel base, shall be at least forty degrees Fahrenheit (40° F).
 4. The Contractor shall maintain a record of temperature of the concrete at the most exposed surfaces of each placement at the beginning and at the end of each day of the curing period, which shall be available to the Engineer.
 - E. Conveying: Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients and in a manner which will assure that the required quality of the concrete is retained.
 - F. Depositing: Delivery and placement of concrete shall be programmed so that the time lapse between batching and placement shall not exceed 1-1/2 hours. Concrete shall not be allowed a free fall of over 4-feet. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to re-handling or flowing.
 - G. Concrete placed in the swimming pool/surge tank shall be placed monolithically to the maximum extent possible.
 - H. Concrete shall be deposited continuously, in horizontal layers of such thickness not deeper than 18-inches that no concrete will be deposited on concrete, which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. Placing shall be carried out at such a rate that the concrete, which is being integrated, with fresh concrete is still plastic. Concrete, which has partially hardened or has been contaminated by foreign materials, shall not be deposited.

- I. Concrete shall be consolidated with the aid of mechanical vibrators in conformance with ACI – “Recommended Practice for Consolidation of Concrete” to produce a dense, homogeneous mass without voids or pockets. Vibrators should be placed in concrete rapidly so as to penetrate approximately 3-inches to 4-inches into the previous lift, to blend the two layers. Vibrating techniques must assure that when the course aggregate reaches the form, it stops and the matrix fills the voids.

3.10 FINISHING OF CONCRETE SURFACES:

- A. The intent of this Specification is to secure for the job materials and workmanship of such quality that the surface is acceptable for the proposed pool finish and that special finishing will be required to produce concrete surfaces equal to the best obtainable with the concrete and forming materials specified. Surfaces which reveal, upon removal of forms, imperfections of such magnitude as to seriously impair the appearance of the structure, in the opinion of the Engineer, shall be deemed cause for rejection, and concrete members containing such imperfections shall be entirely removed and replaced without damage to adjacent materials or extra expense to the Owner. Lesser imperfections of concrete surfaces shall be patched and finished in accordance with the following procedures:
- B. Patching: Areas to be patched shall not exceed 1-1/2 square feet for each 1000 square feet of surface area. Patches shall match in every respect, the color and texture of the surrounding surfaces. Mix formulation shall be determined by trial to obtain a color match when both the patch and the surrounding concrete are cured and dry. After initial set, surfaces of patches shall be textured manually to obtain a match with the surrounding surfaces. All patches are subject to Engineer’s final acceptance as to appearance and quality.
- C. Exposed Vertical Surfaces: Immediately after removal of forms, chip off all fins and other projections, and patch all voids, honeycombs and air pockets exceeding 3/4-inch in any dimension. In areas where concentrations of small voids occur, patch a sufficient number of the voids to produce a uniform appearance across the entire panel. Smooth out projections and fins with wet carborundum stones or power grinders to extent required by Engineer. Pull tie rods and pack voids formed by wood tie-rod cones to a point 3/4-inch from finish surface.
- D. All exposed concrete shall be thoroughly cleaned to remove stains, laitance, dust, form oil, and all other surface residue by use of water, stiff brushes, sandpaper or other means approved by the Engineer.
- E. Finishing of Concealed Concrete Surfaces: At surfaces to receive waterproofing membranes or damp proofing coatings, chip off fins and other projections and trowel patch all voids, honeycombs and air pockets exceeding 1/2-inch in any dimension. Pull tie-rods and patch voids formed by tie-rod cones flush with adjacent surfaces. At outside faces of foundation walls, except for surfaces to receive waterproofing membranes, trowel patch all voids, honeycombs and air pockets exceeding 3/4-inch in depth. At other concealed surfaces, patching, if any, shall be as required by the Engineer and shall, in general, be only such as is required to assure or protect the structural integrity of concrete or reinforcing.

3.11 FLOOR AND OTHER FLATWORK FINISHES:

- A. Concrete for finish floor slabs shall be poured as dry as practicable within allowable slump range. Except when otherwise indicated or specified, concrete finish floor slabs shall be monolithically finished between expansion joints at required elevation by screeding, floating and troweling to provide smooth, even, non-porous finish, free of trowel marks and acceptable for painted finish. Do not begin finish troweling until concrete has hardened sufficiently to prevent excess fines from working to the surface. After troweling is complete and slabs have set sufficiently to ring the trowel, the surfaces of all slabs exposed in the finished work shall be given a second steel troweling to a burnished finish.
- B. Concrete for floor slabs shall be poured to the proper elevations adding concrete to compensate for joist and beam deflections. Slab thickness indicated on drawings is a minimum.
- C. Finish surface shall not vary more than 1/4-inch when measured by a 10-0” straight edge, except at sub-slabs to receive resilient or wood flooring which shall not vary more than 1/8-inch when measured by a 10-0” straight edge. Leveling of the slab by the Contractor to this tolerance for resilient flooring will be allowed by the use of latex type underlayment as approved by the Engineer.

- D. Concrete slabs to receive Portland Cement setting beds or concrete or fills shall be given a rough wood float or broom finish.
- E. No dry cement or mixture of sand and cement shall be applied to surface of any concrete slab to absorb moisture.
- F. Protect floors from damage until completion of job.

3.12 CURING AND PROTECTION:

- A. Forms shall be removed without damage to concrete and to allow time for proper finish. The contractor shall be responsible for the safety of the construction during and after form removal. No act of the Engineer shall relieve the Contractor of this responsibility.
- B. Protect corners from damage after form removal by boxing, corner boards or other means approved by the Engineer.
- C. Formwork for columns, walls, beam sides and other parts not supporting the weight of concrete may be removed as soon as the concrete has reached 30% of its specified 28-day strength, but not before 36 hours, provided it is properly cured and protected.
- D. Formwork for beam soffits, slabs and other parts supporting the weight of concrete shall remain in place until the concrete has reached 100 percent of its specified 28-day strength except that after the concrete has reached 75 percent of its specified 28-day strength, but not before 7 days, the form work may be removed and the elements securely re-shored.
- E. Re-shoring shall remain in place until concrete has reached its specified 28-day strength and until members can safely support their weight and the load thereon. Until the 28-day strength has been achieved, all concrete shall be protected from shock, vibration and heavy loads.
- F. Bracing for foundation walls retaining earth shall remain in place until upper level floor slab has achieved its 28-day strength.
- G. Wet cure concrete after finishing is complete. Continue wet cure for seven (7) days after installation.

3.13 VAPOR BARRIER:

- A. Where specified, apply perimeter insulation in a continuous layer extending below the slab on grade to the top of the wall footing on the inside surface of the exterior foundation walls. Insulation shall be 2-inch thick, set in trowel coat of approved mastic. Lay up insulation, applying mastic to all sides of edges in accordance with manufacturer's instructions.
- B. ¾-inch thick insulation shown installed between concrete floor slabs and concrete foundation walls shall be of same material as specified for perimeter.

3.14 CUTTING OF HOLES:

- A. Cut holes required by other trades in any cast-in-place concrete, which did not receive sleeves. Use a core drilling process or sawing process which produces clean sharp edges and the minimum hole size, which accommodates the piping, conduit, or equipment requiring the opening.
- B. Obtain approval of Engineer before cutting any holes for any trades.

3.15 NON-SHRINK GROUT:

- A. Grout solid all gutters, column leveling plates, anchors, inlets, drains and beam bearing plates in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 03 37 13 - SHOTCRETE FOR SWIMMING POOL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Shotcrete applied by wet-mix process, as shown on the drawings, and as specified herein, and includes, but is not limited to the following:
 - 1. Furnishing, placing, curing, and finishing of all reinforced Shotcrete work.
 - 2. Furnishing, erection and removal of formwork and shoring.
 - 3. Furnishing and placing of reinforcing steel and related accessories.
 - 4. Furnishing and installation of weirs, piping, connection bars and fasteners.
 - 5. Furnishing and installation of railing anchor sockets, and shotcrete steps.
 - 6. Furnishing and installation of joint fillers.
- B. Coordination with all other trades for locating of all pipe sleeves, duct openings, keys, chases, electrical boxes and conduits, anchors, inserts, fastenings, and other devices required by other trades.
- C. Wet cure of exposed shotcrete for ten (10) days.
- D. Shotcrete for stairs, benches, and other features.
- E. Shotcrete for encasement of suction outlet fitting assemblies (e.g. main drains) and piping.
- F. Shotcrete for encasement of return pipes and inlets.
- G. Finishing of shotcrete surfaces acceptable for tile finish.
- H. Dewatering of site during shotcrete operation as required to keep excavation dry and free of groundwater.

1.2 RELATED WORK

- A. Section 03 11 00 - Concrete Formwork for Swimming Pool
- B. Section 03 21 00 - Concrete Reinforcement for Swimming Pool
- C. Section 07 92 00 - Waterstops and Sealants for Swimming Pool
- D. Section 09 34 13 - Tile for Swimming Pool
- E. Section 13 11 00 - Summary of Work for Swimming Pool
- F. Division 26 - Electrical

1.3 REFERENCES

- A. American Concrete Institute (ACI)
 - 1. ACI 117R - Specifications for Tolerances for Concrete Construction and Materials
 - 2. ACI 301 - Specifications for Structural Concrete
 - 3. ACI 305R - Hot Weather Concreting

4. ACI 306.1 - Specification for Cold Weather Concreting
5. ACI 506R - Guide to Shotcrete
6. ACI 506.2 - Specification for Shotcrete

B. ASTM International (ASTM)

1. ASTM A36 - Specification for Carbon Structural Steel
2. ASTM A82 - Specification for Steel Wire, Plain, for Concrete Reinforcement
3. ASTM A153 - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
4. ASTM A185 - Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
5. ASTM A307 - Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
6. ASTM A497 - Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete
7. ASTM A615 - Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
8. ASTM A706 - Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
9. ASTM A767 - Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
10. ASTM A820 - Specification for Steel Fibers for Fiber Reinforced Concrete
11. ASTM C33 - Specification for Concrete Aggregates
12. ASTM C42 - Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
13. ASTM C94 - Standard Specification for Ready-Mixed Concrete
14. ASTM C150 - Specification for Portland Cement
15. ASTM C171 - Specification for Sheet Materials for Curing Concrete
16. ASTM C173 - Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
17. ASTM C231 - Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
18. ASTM C260 - Specification for Air-Entraining Admixtures for Concrete
19. ASTM C309 - Specification for Liquid Membrane-Forming Compounds for Curing Concrete
20. ASTM C494 - Specification for Chemical Admixtures for Concrete
21. ASTM C618 - Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
22. ASTM C979 - Specification for Pigments for Integrally Colored Concrete
23. ASTM C1064 - Test Method for Temperature of Freshly Mixed Portland Cement Concrete
24. ASTM C1077 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
25. ASTM C1116 - Specification for Fiber-Reinforced Concrete and Shotcrete
26. ASTM C1141 - Specification for Admixtures for Shotcrete
27. ASTM C1240 - Specification for Silica Fume for Use as a Mineral Admixture in Hydraulic Cement Concrete, Mortar, and Grout
28. ASTM D1751 - Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
29. ASTM D1752 - Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
30. ASTM E329 - Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

C. Concrete Reinforcing Steel Institute (CRSI)

1. Manual of Standard Practice
2. SSPC: The Society for Protective Coatings
3. SSPC-SP 6/NACE No. 3 2000 – Joint Surface Preparation Standard SSPC-SP 6/NACE No. 3: Commercial Blast Cleaning

1.4 DEFINITIONS

- A. Shotcrete: Mortar or concrete pneumatically projected onto a surface at high velocity.
- B. Dry-Mix Shotcrete: Shotcrete with most of the water added at nozzle.

- C. Wet-Mix Shotcrete: Shotcrete with ingredients, including water, mixed before introduction into delivery hose or supplied by ready-mix company.

1.5 SUBMITTALS

- A. Product Data: Submit for manufactured materials and products including reinforcement and forming accessories, shotcrete materials and curing compounds.
- B. Shop Drawings: Submit for details of fabricating, bending, and placing reinforcement. Include support and anchor details, number and location of splices, and special reinforcement required for openings through shotcrete structures.
- C. Design Mixes: Submit design mixes for each shotcrete mix.
- D. Quality Assurance/Control Submittals
 1. Submit manufacturer's certificates that products meet or exceed specified requirements.
 2. Submit test results prepared by a qualified independent testing laboratory.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm specializing in manufacture of shotcrete materials, with minimum 10-years of experience.
- B. Quality Assurance/Control Testing: Test Reports prepared by a qualified independent laboratory indicating compliance with the following performance requirements:
 1. ACI 301 - Specifications for Structural Concrete
 2. ACI 506.2 - Specification for Shotcrete
- C. Testing Agency Qualifications: An independent agency qualified according to ASTM C1077 and ASTM E329 for testing indicated.
- D. Pre-Installation Meeting: At least three weeks prior to commencing masonry work conduct a meeting at the project site to discuss contract requirements and job conditions; require the attendance of Contractor, and installers of related materials; notify Engineer in advance of meeting.

1.7 PROJECT CONDITIONS

- A. Cold-Weather Shotcreting: Protect shotcrete work from physical damage or reduced strength caused by frost, freezing, or low temperatures according to ACI 306.1 and as follows:
 1. Discontinue shotcreting when ambient temperature is 40 degrees Fahrenheit and falling. Uniformly heat water and pre-packaged materials before mixing to obtain a shotcrete shooting temperature of not less than 50 degrees Fahrenheit and not more than 90 degrees Fahrenheit.
 2. Do not use frozen materials or materials containing ice or snow.
 3. Do not place shotcrete on frozen surfaces or surfaces containing frozen materials.
 4. Do not use calcium chloride, salt, or other materials containing antifreeze agents.
- B. Hot-Weather Shotcreting: Mix, place, and protect shotcrete according to ACI 506R when hot weather conditions and high temperatures would seriously impair quality and strength of shotcrete, and as follows:
 1. Cool ingredients before mixing to maintain shotcrete temperature at time of placement below 100 degrees Fahrenheit for dry mix or 90 degrees Fahrenheit for wet mix.
 2. Reduce temperature of reinforcing steel and receiving surfaces below 100 degrees Fahrenheit before shotcreting.

- C. Contractor shall submit to the Engineer a minimum of twenty-one (21) days prior to the pour the proposed method of curing the placed shell for either hot weather or cold weather curing.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Forms: Form facing panels that will provide continuous, straight, smooth, concrete surfaces. Furnish panels in the largest practicable sizes to minimize number of joints.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A615, Grade 60 (Grade 420), deformed.
- B. Plain-Steel-Welded Wire Fabric: ASTM A185, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed Steel Welded Wire Fabric: ASTM A497, flat sheet.
- D. Supports: Bolsters, chairs, spacers, ties, and other devices for spacing, supporting, and fastening reinforcing steel in place according to CRSI's "Manual of Standard Practice" and as follows:
 - 1. For uncoated reinforcement, use CRSI Class 1, plastic-protected bar supports.
- E. Reinforcing Anchors: ASTM A36, un-headed rods or ASTM A307, Grade A, hex-head bolts; carbon steel; and carbon-steel nuts.
 - 1. Finish: Hot-dip zinc coating, ASTM A 153, Class C.
- F. Epoxy coated rebar shall be rejected.

2.3 READY-MIXED SHOTCRETE

- A. Ready Mixed Concrete: Except as otherwise provided in these specifications, ready mixed concrete shall be batched, mixed, and transported in accordance with ASTM C94.
- B. Mixing Water Control:
 - 1. Concrete which arrives at the site with slump below that suitable for placement may be adjusted by the addition of water to increase slump provided that the maximum slump is not exceeded. Any addition of water to increase slump shall be followed by mixing of at least 30 revolutions of the drum.
 - 2. After adjustment to the proper slump, discharging shall be allowed for as long as the concrete retains its workability without the addition of water.
 - 3. Compressive strength of the mixture shall be 4500 psi after 28 days.

2.4 SHOTCRETE MATERIALS DRY PROCESS

- A. Specification Mix: Dry process Shotcrete is a pre-blended, high early strength, cement-based product containing Portland cement, aggregate (ACI Gradation 1, 2 or 3), fly ash, silica fume, steel or synthetic fibers, and chemical admixtures specifically designed for use in pool construction.
 - 1. Coloring Agent: ASTM C979, synthetic mineral-oxide pigments or colored, water-reducing admixtures, color stable, non-fading, and resistant to lime and other alkalis.

2. Applicable Standards: ASTM A820, ASTM C33, ASTM C150, ASTM C260, ASTM C494, ASTM C618, ASTM C1116, ASTM C1141, ASTM C1240, ACI 506.2.
3. Or approved equal.

2.5 ACCESSORY MATERIALS

- A. Water: Clean and free from deleterious acids, alkalis, and organic matter.
- B. Ground Wire: High-strength steel wire, 0.8 to 1 millimeter in diameter.
- C. Joint Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork, or self-expanding cork.

2.6 CURING MATERIALS

- A. Absorptive Cover: AASHTO M182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 ounces per square yard, dry
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Clean and free from deleterious acids, alkalis, and organic matter.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B.

2.7 SHOTCRETE MIXTURES, GENERAL

- A. Prepare design mixes for each type and strength of shotcrete.
- B. Design-Mix Adjustments: Subject to compliance with requirements, shotcrete design-mix adjustments may be proposed when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.8 SHOTCRETE MIXTURES

- A. Mix pre-packaged shotcrete materials with water either in dry mix or wet mix process to provide shotcrete with the following properties:
 1. Compressive Strength (28 Days): 4500 psi.
 2. If pre-packaged, air-entrained mixtures are selected, verify that normal-weight, wet-mix shotcrete has an air content before pumping of 8 percent with a tolerance of plus or minus 1 percent.
 3. Water: Cement Ratio – All concrete shall have a maximum water-cement ratio of 0:45 percent. This is total water in mix at time of placement, including free water of aggregates and liquid admixtures.
 4. Slump of concrete:
 - a. Walls: minimum 1-inch, maximum 3-inches
 - b. Floors: 4-inches
 - c. Slab-on-metal forms: 3-inches
 5. Pre-mix admixtures in solution form and dispense as recommended by the manufacturer. Include the water in the solution in the design water content of the mixtures.

2.9 SHOTCRETE EQUIPMENT

- A. Mixing Equipment: Capable of thoroughly mixing shotcrete materials in sufficient quantities to maintain continuous placement.
- B. Dry-Mix Delivery Equipment: Capable of discharging aggregate-cement mixture into delivery hose under close control and maintaining continuous stream of uniformly mixed materials at required velocity to discharge nozzle. Equip discharge nozzle with manually operated water-injection system for directing even distribution of water to aggregate-cement mixture.
 - 1. Provide uniform, steady supply of clean, compressed air to maintain constant nozzle velocity while simultaneously operating blow pipe for cleaning away rebound.
 - 2. Provide water supply with uniform pressure at discharge nozzle to ensure uniform mixing with aggregate-cement mix. Provide water pump to system if line water pressure is inadequate.
- C. Wet-Mix Delivery Equipment: Capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously.

2.10 MIXING

- A. Dry-Mix Process: Dampen pre-packaged shotcrete materials and thoroughly mix prior to use.
 - 1. Verify with manufacturer the water mix ratio at head to achieve specified mix design prior to application.
- B. Wet-Mix Process: Thoroughly mix clean water with pre-packaged shotcrete materials in batch mixer prior to use.
 - 1. Verify with manufacturer quantity of water to be added to batch to achieve specified mix design.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Concrete or Masonry: Before applying shotcrete, remove unsound or loose materials and contaminants that may inhibit shotcrete bonding. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2-inch deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces before shotcreting.
 - 1. Abrasive blast or hydroblast existing surfaces that do not require chipping to remove paint, oil, grease, or other contaminants and to provide roughened surface for proper shotcrete bonding.
- B. Earth: Compact and trim to line and grade before placing shotcrete. Do not place shotcrete on frozen surfaces. Dampen surfaces before shotcreting.
- C. Rock: Clean rock surfaces of loose materials, mud, and other foreign matter that might weaken shotcrete bonding.
- D. Steel: Clean steel surfaces by abrasive blasting according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

3.2 FORMS

- A. General: Design, erect, support, brace, and maintain forms, according to ACI 301, to support shotcrete and construction loads and to facilitate shotcreting. Construct forms so shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.
 - 1. Fabricate forms to be readily removable without impact, shock, or damage to shotcrete surfaces and adjacent materials.
 - 2. Construct forms to required sizes, shapes, lines, and dimensions using ground wires and depth gages to obtain accurate alignment, location, and grades in finished structures. Construct forms to prevent leakage but permit escape of air and rebound during shotcreting. Provide for openings, offsets, blocking, screeds, anchorages, inserts, and other features required in the Work.
- B. Form openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations from trades providing such items. Accurately place and securely support items built into forms.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that weaken shotcrete bonding.
- C. Securely embed reinforcing anchors into existing substrates, located as required.
- D. Accurately position, support, and rigidly secure reinforcement against displacement by formwork, construction, or shotcreting. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
- E. Place reinforcement to obtain minimum coverage for shotcrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during shotcreting. Set wire ties with ends directed into shotcrete, not toward exposed shotcrete surfaces.
- F. 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.

3.4 JOINTS

- A. Construction Joints: Locate and install construction joints tapered to a 1:1 slope where joint is not subject to compression loads and square where joint is perpendicular to main reinforcement. Continue reinforcement through construction joints, unless otherwise indicated.
- B. Contraction Joints: Construct contraction joints in shotcrete using saw cuts 1/8-inch wide by 1/3 slab depth or joint-filler strips 1/4-inch wide by 1/3 shotcrete depth, unless otherwise indicated.
 - 1. After shotcrete has cured, remove strip inserts and clean groove of loose debris.
 - 2. Space joints as shown on the contact plans, horizontally and vertically.
 - 3. Tool edges round on each side of strip inserts if floated or troweled finishes are required.

3.5 ALIGNMENT CONTROL

- A. Ground Wires: Install ground wires to establish thickness and planes of shotcrete surfaces. Install ground wires at corners and offsets not established by forms. Pull ground wires taut and position adjustment devices to permit additional tightening.

3.6 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by shotcrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.7 APPLICATION

- A. Apply temporary protective coverings and protect adjacent surfaces against deposit of rebound and overspray or impact from nozzle stream.
- B. Moisten substrate immediately before placing shotcrete.
- C. Moisten wood forms immediately before placing shotcrete where form coatings are not used.
- D. Provide a platform that permits nozzleman unobstructed access to the receiving surface. Place shotcrete first in corners, recesses, and other areas where rebound or overspray cannot escape easily.
- E. Apply shotcrete according to ACI 506.2.
- F. Apply dry-mix shotcrete materials within 45 minutes after pre-dampening and wet-mix shotcrete materials within 90 minutes after batching.
- G. Deposit shotcrete continuously in multiple passes, to required thickness, without cold joints and laminations developing. Place shotcrete with nozzle held perpendicular to receiving surface. Begin shotcreting in corners and recesses.
- H. Remove and dispose of rebound and overspray materials during shotcreting to maintain clean surfaces and to prevent rebound entrapment.
- I. Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray and prevent buildup against front face during shotcreting.
- J. Do not place subsequent lifts until previous lift of shotcrete can support new shotcrete.
- K. Do not apply shotcrete on surfaces withstanding water or running water.
- L. Place shotcrete to completely encase reinforcing steel. Encase reinforcement by shooting with sufficient velocity and plasticity so material flows around and behind the reinforcement. Front face of reinforcement shall remain clean during encasement.
- M. Place shotcrete to provide the cover over reinforcement required by ACI 301 or as otherwise detailed on drawings.
- N. Do not permit shotcrete to sag, slough, or dislodge.

- O. Remove hardened overspray, rebound, and laitance from shotcrete surfaces to receive additional layers of shotcrete; dampen surfaces before shotcreting.
- P. Do not disturb shotcrete surfaces before beginning finishing operations.
- Q. Remove ground wires or other alignment control devices after shotcrete placement.
- R. Installation Tolerances: Place shotcrete without exceeding installation tolerances permitted by ACI 117R, increased by a factor of 2.

3.8 SURFACE FINISHES

- A. General: Finish shotcrete according to descriptions in ACI 506R.
- B. Natural Finish:
 - 1. Gun Finish: Natural undisturbed finish.
 - 2. Rod Finish: Rough-textured finish obtained by cutting or screeding exposed face of shotcrete to plane by rod or straightedge after initial set.
- C. Flash-Coat Finish: After screeding and rodding surface, apply up to 1/4-inch coat of shotcrete using ACI 506R, Gradation No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 sieve to provide a finely textured finish.
- D. Flash-Coat and Final Finish: After screeding and rodding surface, apply up to 1/4-inch coat of shotcrete using ACI 506R, Gradation No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 sieve and apply brush-float finish.
- E. Finish-Coat Finish: After screeding and rodding surface, apply shotcrete finish coat, 1/4-inch to 1-inch thick, using ACI 506R, Gradation No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 sieve to provide a finish of uniform texture and appearance.
- F. Finish-Coat and Final Finish: After screeding and rodding surface, apply shotcrete finish coat, 1/4-inch to 1-inch thick, using ACI 506R, Gradation No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 sieve and apply brush-float finish.

3.9 CURING

- A. Protect freshly placed shotcrete from premature drying and excessive cold or hot temperatures.
- B. Start initial curing as soon as free water has disappeared from shotcrete surface after placing and finishing.
- C. Curing Exposed Surfaces: Cure shotcrete by one of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for at least seven days with water, continuous water-fog spray, water-saturated absorptive covers, or moisture-retaining covers. Lap and seal sides and ends of covers.
 - 2. Curing Compound: Apply curing compound uniformly in continuous operation by power spray 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. Apply curing compound to natural or gun-finished shotcrete at rate of 1 gallon per 100 square feet.

- D. Curing Formed Surfaces: Cure formed shotcrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.10 FORM REMOVAL

- A. Forms not supporting weight of shotcrete may be removed after curing at not less than 50 degrees Fahrenheit for 24 consecutive hours after gunning, provided shotcrete is hard enough not to be damaged by form-removal operations and provided curing and protecting operations are maintained.
 1. Leave forms supporting weight of shotcrete in place until shotcrete has attained design compressive strength. Determine compressive strength of in-place shotcrete by testing representative field-cured specimens of shotcrete.
 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 materials are unacceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

3.11 FIELD QUALITY CONTROL

- A. Testing Laboratory: Independent of the Owner, Engineer and Contractor; the testing laboratory, in addition to meeting requirements of ASTM E-329 and must be an approved laboratory competent to perform concrete physical testing. All tests must be performed in strict accordance with the applicable ASTM standard.
- B. Distribution of Results of Tests: Within 24 hours of results of tests, copies of the results shall be submitted to the Engineer, Contractor and the supplier if applicable.
- C. Shotcrete Testing:
 1. Air Content: ASTM C 173, volumetric method or ASTM C 231, pressure method; 1 test for each compressive-strength test for each mix of air-entrained, wet-mix shotcrete measured before pumping.
 2. Shotcrete Temperature: ASTM C 1064; 1 test hourly when air temperature is 40 degrees Fahrenheit and below and when 80 degrees Fahrenheit and above, and 1 test for each set of compressive-strength specimens.
 3. In-Place Shotcrete: Take a set of 3 unreinforced cores for each mix and for each workday or for every 50 cubic yards of shotcrete placed; whichever is less. Test cores for compressive strength according to ACI 506.2 and ASTM C 42. Do not cut steel reinforcement.
 - a. Strength of shotcrete will be considered satisfactory when mean compressive strength of each set of 3 unreinforced cores equals or exceeds 85 percent of specified compressive strength, with no individual core less than 75 percent of specified compressive strength. Cores shall be tested at seven and twenty-eight days for compressive strength.
 - b. For dry applied process, shotcrete shall be shot onto 30-inch by 30-inch panels for every 50 cubic yards placed. Four cores shall be taken from these panels and tested. Testing shall be performed in accordance with ASTM C1140. Cores shall be tested at seven and twenty-eight days for compressive strength.

3.12 REPAIRS

- A. Remove and replace shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete.

- B. Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2-inch deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces and apply new shotcrete.
- C. Repair core holes from in-place testing according to repair provisions in ACI 301 and match adjacent finish, texture, and color.

3.13 CLEANING

- A. Remove and dispose of rebound and overspray materials from final shotcrete surfaces and areas not intended for shotcrete placement.

END OF SECTION 03 37 13

SECTION 03 48 00.13 - PRECAST CONCRETE STRUCTURES FOR SWIMMING POOL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Furnish and install the swimming pool collector tank.

1.2 RELATED WORK

- A. Section 07 92 00 - Waterstops and Sealants for Swimming Pool
- B. Section 13 11 00 - Summary of Work for Swimming Pool
- C. Section 13 11 00.16 - Equipment for Swimming Pool
- D. Section 13 11 43 - Perimeter Overflow Recirculation System
- E. Division 26 - Electrical

1.3 QUALITY ASSURANCE

- A. The collector tanks shall be tested with a static water test to ensure the tanks do not leak.

1.4 SUBMITTALS

- A. Shop drawings of the materials of this section.
- B. Tank drawings shall be stamped by a Registered Professional Engineer. They shall display that they are designed to withstand hydraulic uplift. Uplift shall be established with the water table at the top of the tank.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Collector Tank: The collector tank shall be constructed of reinforced concrete and sized in accordance with contract drawings. Provide a seamless tank below the proposed lid. The collector tanks shall have an HS-20 minimum load rating. A hatch cover shall be incorporated into the precast tank with a precast riser to extend the hatch level with the proposed grade or as indicated on the contract drawings.
- B. Tanks shall have the minimum capacities indicated on the contract drawings.
- C. The collector tanks shall be constructed of 5,000 psi concrete, shall have a minimum wall thickness of 6-inches, and shall be coated with a bituminous coating on the exterior of the structure.
- D. The holding tank shall be constructed to meet or exceed a design loading class of AASHTO HS20 44.

- E. A riser section with a 3-feet by 3-feet opening for the collector tank shall be an aluminum hatch with stainless steel frame and hardware as specified on the contract drawings. Hatches shall extend from the top slab of the holding tank finished flush with the finished deck or as indicated on the contract drawings. Riser section seams shall be watertight. The hatch shall provide 150 pounds per square foot with a deck recess cover to accept concrete infill. Hatch covers shall be:
 - 1. Type TER Floor Access Door as manufactured by The Bilco Company, New Haven, CT
 - 2. FT8050 as manufactured by Acudor Access Panels, New York, New York
 - 3. FDPPA as manufactured by Nystrom, Minneapolis, MN
 - 4. Or approved equal
- F. All tank segment seals shall be butyl rubber, designed for drinking water use. The butyl rubber seal shall be able to withstand breakdown from sodium hypochlorite and calcium hypochlorite.
- G. All penetrations shall be sealed with a Link Seal or approved equal. All penetrations shall have a mechanical seal.
- H. Tank shall have rubber coated ladder rungs aligned over an access hatch extending to the bottom of the tank.
- I. Exterior of the tank shall receive a bituminous coating.
- J. All joints shall be sealed in accordance with the requirements of the Related Work.

2.2 INSTALLATION

- A. The collector tanks and appurtenances shall be installed in accordance with the manufacturer's instructions, as indicated on the contract drawings, and in accordance with local and state codes.
- B. Piping penetrations shall be coordinated by the Contractor.

2.3 TESTING

- A. The collector tanks shall be water tested for a 24-hour period. The tanks shall be filled to full capacity. The tanks shall stay filled to capacity for a minimum of 24 hours. If in this time the water in the tank drops more than a 1/4-inch, the tank shall be drained, repaired, and retested until the tank complies with the allowable loss.

END OF SECTION 03 48 00.13

SECTION 07 92 00 - WATERSTOPS AND SEALANTS FOR SWIMMING POOL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Furnish all materials, equipment, labor, and services required for all waterstops, caulking, and sealants.
 - 1. Include sealants, joint backup, primers, elastomeric and PVC waterstop.
 - 2. Refer to contract drawings for locations and additional requirements.
- B. Waterstop and sealants are required on all concrete containment curbs, and where pool walls meet pool poured-floor, pool walls meet pool walls, floor-to-floor, at all tank walls, pool supports and manholes, at any construction or expansion joint, and as shown on the drawings.
- C. Furnish and install waterproof coating and sealants for the swimming pool.
- D. Furnish and install waterproof coating and sealants for the collector tank.
- E. Furnish, install, and maintain all staging, scaffolding, and hoisting required for this work.

1.2 RELATED WORK

- A. Section 03 11 00 - Concrete Formwork for Swimming Pool
- B. Section 03 21 00 - Concrete Reinforcement for Swimming Pool
- C. Section 03 37 13 - Shotcrete for Swimming Pool
- D. Section 03 48 00.13 - Precast Concrete Collector Tanks and Structures
- E. Section 09 34 13 - Tile for Swimming Pool
- F. Section 13 11 00 - Summary of Work for Swimming Pool
- G. Section 13 11 43 - Perimeter Overflow Recirculation System
- H. Division 26 - Electrical

1.3 QUALITY ASSURANCE

- A. Materials used in fulfilling the requirements of this Section shall be suitable for each intended use and shall be of the type specified for each category. Materials shall be applied under temperatures required for each type in accordance with the manufacturer's recommendations.
- B. Compounds shall contain no acid or ingredients that will affect masonry, corrode metal, or have injurious effects on paint.
- C. Use proper materials specified herein for each location where the contract drawings call for sealants.
- D. Work shall conform to Federal Specifications.

1.4 REFERENCES

- A. Federal Specifications published by the United States Government, available from General Services Administration, Specification and Consumer Information Distribution Service, Washington Navy Yard Building 197, Washington, D.C.
- B. ASTM International (ASTM)
 - 1. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants

1.5 SUBMITTALS

- A. Submit manufacturer's literature of the materials of this section.
- B. Submit manufacturer's product description, performance, and test data on all materials for Engineer's review.
- C. Submit manufacturer's certification of compliance with these specifications for each material, indicating that the material is acceptable for use in swimming pools.

1.6 SAMPLES

- A. Submit samples of all products and materials listed in this section.
- B. Sealant samples shall be 3-inch strips joining wood, metal, or hardboard. Joint backup sample shall be 6-inches long, 1/2-inch or greater in diameter. Foam sealant shall also be 6-inches long.
- C. Colors of all materials shall be as selected by the Architect.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Each container shall bear an unbroken seal, test number and label of the manufacturer upon delivery at the site. Unlabeled materials will be rejected and shall be removed from the site and replaced with approved-labeled materials at no additional cost to the Owner.
- B. Deliver materials to site and install work under this Section in ample time to avoid delay in job progress and at such times as to permit proper coordination of the various parts.
- C. Store waterstop materials under tarps to protect from oil, dirt, and sunlight.

1.8 GUARANTEES

- A. Attention is directed to provisions of the general conditions regarding guarantees and warranties for work under this contract.
- B. Manufacturers shall provide their standard guarantees for work under this section. However, such guarantees shall be in addition to and not in lieu of all other liabilities which manufacturers and Contractor may have by law or by other provisions for the Contract Documents.

PART 2 - PRODUCTS

2.1 SEALANTS – POOL DECK, POOL, AND ALL SUBMERGED APPLICATIONS

- A. Sealants shall be non-staining materials conforming to the requirements of United States of America Standards Institute "Standard Specification for Polysulfide Base Sealing Compounds for the Building Trade", USA 116.1. Compound shall be Class A (self-leveling), or Class B (non-sag), as applicable in each case for the joint to be caulked. Color of sealant shall match as closely as possible the color of the surrounding materials, and when used adjacent to masonry work the compound shall match the color of the mortar in the masonry joints. Precise color shall in all cases be subject to the approval of the Engineer. Material shall be a Two-Part Polysulfide base, and resistant to chlorine up to 20 PPM.
- B. Sealants shall be:
 - 1. WR Meadows – Deck-o-Seal 125 or Deck-o-Seal Gun Grade
 - 2. Sika USA – Duoflex NS
 - 3. Tammsflex NS, Tammsflex SL as manufactured by Euclid Chemical
 - 4. Or approved equal

2.2 JOINT-SEALANT BACKINGS

- A. General: Provide sealant backings of material and type that are non-staining, compatible with joint substrates, sealants, primers, and other joint fillers, and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials, or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealants 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 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: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

2.4 WATERSTOPS

Waterstop manufacturer shall demonstrate a minimum of five years of continuous, successful experience in production of waterstop materials.

- A. Waterstop manufacturer shall demonstrate five years (minimum) continuous, successful experience in production of Waterstop.
- B. Surface Applied Hydrophilic Water Stop
 - 1. Waterstop shall be a water-swelling, waterstop.
 - 2. Waterstop shall expand a minimum of 2 times (100%) by volume in the presence of water.
 - 3. Internal pressure, when in contact with water, shall not exceed 75 psi.
 - 4. Hydrophilic waterstop shall be manufactured by either Sika Hydrotite or approved equal.
- C. Low-pressure Surface Applied Water Stop
 - 1. Use where indicated
 - 2. Provide Ultraseal KBA-1510 FP paired with P-201 sealant, manufactured by Adeka Corporation
 - a. P-201 sealant shall be applied for adhesion only, as recommended by Manufacturer.
- D. Flexible Polyvinyl Chloride Waterstops
 - 1. Interior Pool Application: Provide 6-inch center bulb waterstop, Model Number 717, manufactured by Greenstreak, or approved equal.
 - 2. Gutter and Deck Connection: Provide 4-inch center bulb waterstop, Model Number 701, Manufactured by Greenstreak or approved equal. The PVC waterstop shall be extruded from an elastomeric plastic material of which the basin resin is prime virgin polyvinyl chloride. The PVC compound shall not contain any scrapped or reclaimed material or pigment whatsoever.
 - 3. PVC waterstop shall not stain or discolor concrete or adjacent metal structures.
- E. Performance Requirements as follows:

Property	Test Method	Required Limits
Water Absorption	ASTM D570	0.15 percent maximum
Tear Resistance	ASTM D624	300 pounds per inch minimum
Ultimate Elongation	ASTM D638	350 percent minimum
Tensile Strength	ASTM D638	2,000 pounds per square inch minimum
Low Temperature Brittleness	ASTM D746	no failure at negative 35 degrees Fahrenheit
Stiffness in Flexure	ASTM D747	700 pounds per square inch minimum
Specific Gravity	ASTM D792	1.38 maximum
Hardness, Shore A	ASTM D2240	79 +/- 3
Tensile Strength after Accelerated Extraction	CRD-C 572	1,600 pounds per square inch minimum
Elongation after Accelerated Extraction	CRD-C 572	300 percent minimum
Effects of Alkalis after 7 Days: Weight Change Hardness Change	CRD-C 572	Between negative 0.10 percent and 0.25 percent +/- 5 points

2.5 ACCESSORIES

- A. Provide factory made waterstop fabrications for all changes of direction, intersections, and transitions leaving only straight butt joint splices for the field.
- B. Provide hog rings or grommets spaced at 12-inches on center along length of waterstop.
- C. Provide Teflon coated, thermostatically controlled waterstop splicing irons for field butt splices.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Surfaces to receive waterstop and sealants shall be clean, dry, and free of oil, dust, and loose particles.
- B. Before starting work, inspect all surfaces to receive waterstop and sealant work and report in writing to the Engineer any surfaces that are not suitable for application of such materials.
- C. Unsuitable surfaces shall be corrected before work begins. Commencement of material application to any surface shall constitute acceptance of that surface as proper to receive the work. Subsequent defects in work shall be corrected under this Section without additional cost to the Owner.

3.2 PREPARATION FOR SEALANTS AND WATERSTOPS

- A. Notify the proper trades of locations where adequate rabbets for sealant have not been provided; all such rabbets shall be prepared by cutting and cleaning out material to the minimum depth required and by grinding to the minimum width by the appropriate trade.
- B. Wire brush full depth of joints in concrete, masonry, mortar and plaster as required to obtain a firm, clean surface. Clean metal surfaces with wire brush where required to remove scale and other deposits and wipe clean with a mild, non-staining solvent. Clean other surfaces by methods approved by the sealant manufacturer. Where joint has been mortar-filled, rake out existing mortar 3-3/4-inches deep.
- C. Prime surfaces to receive sealing compounds where recommended by manufacturer in accordance with manufacturer's printed instructions.
- D. Install continuous lengths of joint backing material in proper size, shape, and depth. Except where otherwise specified or recommended by manufacturer, depths of joints with a width less than or equal to 1/2-inch shall be approximately the same as the width. Depth of joints greater than 1/2-inch in width shall be approximately 1/2 the width of the joint. No sealed joint shall be less than 1/4-inch deep.
- E. Install joint backup in all exterior joints in excess of 5/8-inch depth, and in all interior joints requiring backup, placing the bead in the joint in a manner that will assure constant sealant material depth. Set bead into joint continuously by slightly stretching during placement to permit compression against sides of joint without surface wrinkles or buckles.
- F. Waterproof membrane shall be installed on clean concrete surface and membrane drain shall be protected from being plugged or covered with material.

3.3 SEALANT APPLICATION

- A. Apply sealant only to clean, dry surfaces, and only when the ambient temperature is within manufacturer's recommended range.
- B. Application shall be in strict accordance with manufacturer's printed instructions.
- C. Apply gun grade sealants with sealant guns of type approved by sealant manufacturer using nozzles sized to fit into joints and drive material with sufficient pressure to fill all voids. Install sealants in continuous, uninterrupted, full-length beads. Superficial pointing of joints with a thin bead of compound will not be acceptable.

- D. Apply pouring grade sealant at horizontal and deck joints in accordance with manufacturer's recommendations over joint backing. Joints shall be continuously filled, level and smooth.
- E. Neatly point and tool all finished joints, concave, uniformly smooth and free of wrinkles, waves, sag lines, and other imperfections. Keep outer edge of sealant 1/8-inch back from face of surrounding material. Remove masking tape immediately after tooling but before sealant has set.
- F. Provide sealant at exterior saddles and thresholds not sealed under another Section. Set same in a full bed of exterior sealant not less than 3/8-inch thick. Clean off excess compound after installing.
- G. Surfaces of all materials adjoining sealant joints shall be fully protected and be kept clean and free of smears of compound or other soiling due to sealant application. Use non-staining masking tape as required.

3.4 COMPRESSION SEAL INSTALLATION (WATERSTOP)

- A. Follow manufacturer's instructions for sizing and installing PVC. Use tools, adhesives and lubricants as recommended.
- B. Seal shall fill entire opening snugly to prevent water entry. Edges shall be straight and without ripples or wrinkles.
- C. All connections shall be welded together and tested to insure watertight seal.

3.5 INSTALLATION

- A. Field butt splices shall be heat fused welded using a Teflon coated thermostatically controlled waterstop splicing iron at approximately 380 degrees Fahrenheit. Follow approved manufacturer recommendations. Lapping of waterstop, use of adhesives, or solvents shall not be allowed.
- B. Center waterstop in joint and secure waterstop in correct position using hog rings or grommets spaced at 12-inches on center along the length of the waterstop and wire tie to adjacent reinforcing steel.

3.6 FIELD QUALITY CONTROL

- A. Waterstop splicing defects which are unacceptable include, but are not limited to the following:
 1. Tensile strength less than 80 percent of parent section.
 2. Misalignment of center bulb, ribs, and end bulbs greater than 1/16-inch.
 3. Bond failure at joint deeper than 1/16-inch or 15 percent of material thickness.
 4. Misalignment that reduces waterstop cross section by more than 15 percent.
 5. Visible porosity in the weld.
 6. Bubbles or inadequate bonding.
 7. Visible signs of splice separation when cooled splice is bent by hand at a sharp angle.
 8. Charred or burnt material.

3.7 PROTECTION AND CLEANING

- A. Clean all surfaces of adjacent surfaces, which have been marked or soiled by the work of this Section, removing all excess materials there from. Use only cleaning materials and solvents that will not damage the surfaces in any way.

- B. Remove all debris and rubbish as the work progresses, and legally dispose of same.
- C. At completion of work, do final cleaning, leaving the work and adjacent surfaces in a clean and neat condition.

END OF SECTION 07 92 00

SECTION 09 34 13 - TILE FOR SWIMMING POOL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Furnish and install ceramic tile finish and markings on racing lanes and wall targets, gutter face, waterline, and all exposed protruding edges under the water surface (nosings) as indicated on the drawings, or as shown on contract documents.
- B. Furnish and install ceramic deck depth and warning markings shall be furnished only at pool edge as indicated on pool drawings or as shown on contract documents (Installation by Deck Contractor). PVC or Tile Markings shall be supplied and installed on gutter by pool contractor.
- C. Furnish and install ceramic tile interior finish.

1.2 RELATED WORK

- A. Section 03 37 13 - Shotcrete for Swimming Pool
- B. Section 13 11 00 - Summary of Work for Swimming Pool

1.3 QUALITY ASSURANCE

- A. Work and materials for tiling shall be in accordance with system W244-91 of the TCA Handbook.

1.4 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C1028 - Tile Slip Resistance
 - 2. ASTM C1027 - Tile Resistance to Abrasion and Tread Wear
 - 3. ASTM C1026 - Tile Resistance to Freeze-Thaw Cycling
 - 4. ASTM C373 - Tile Water Absorption
 - 5. ASTM C650 - Tile Chemical Resistance
 - 6. ASTM C648 - Tile Break Strength
 - 7. ASTM C1378 - Tile Stain Resistance and Maintainability
 - 8. ASTM C150 - Portland Cement
 - 9. ASTM C144 - Aggregate for Masonry Mortar
 - 10. ASTM C207 - Hydrated Lime for Masonry Purposes
- B. American National Standards Institute (ANSI)
 - 1. ANSI A108/A118/A136.1 - Installation of Ceramic Tile
 - 2. ANSI A137.1 - Ceramic Tile
- C. Tile Council of North America
 - 1. TCNA Handbook for Ceramic, Glass and Stone Tile Installation, latest edition

1.5 SUBMITTALS

- A. Shop drawings indicating tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, thresholds, and setting details.
- B. Three full size samples of each color tile selected, one full size sample of each special shape required, and samples of divider strip and of cured pointing mortar, and proposed deck depth markers and wall depth

markers. Samples of pointing mortar shall be resubmitted as required until color and texture are approved by the Engineer.

1.6 PRODUCT DELIVERY AND STORAGE

- A. Deliver tile materials to site in unopened factory containers sealed with Grade Seals bearing printed name or manufacturer and the words "Standard Grade". Keep the Grade Seals intact and containers dry until tiles are used.
- B. Tile accessory materials shall be protected from damage and deterioration during delivery, storage and installation.
- C. Tile containers shall not be opened, or the manufacturer's seals broken until they have been inspected by the Engineer.
- D. A master grade certificate shall be submitted to the Engineer. The certificate shall be the signature of the installer and the manufacturer and shall state the kinds and grades of tile furnished. The identification marks on the tile shall correspond with marks on the certificate.
- E. Keep cementitious materials dry until used.

1.7 GUARANTEES:

- A. The Contractor shall agree to repair or replace any work at no cost to the Owner, upon written notification from the Owner within the warranty period. Prorated warranties are not acceptable.
- B. Setting materials must be provided by the same manufacturer. Mixing materials and application procedures must be done in accordance with manufacturer's recommendations and requirements.
- C. Documentation must be provided to this effect by the Contractor with verification from the manufacturer. This documentation must be included in the operations and maintenance manual under warranties as documentation qualifying the project for a 25 Year Systems Warranty by Laticrete or approved equal.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS:

- A. Portland Cement: ASTM C150, Type II, low alkali.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Mortar Sand: ASTM C144 sand except all passing the No. 30 sieve.
- D. Joint Sand: Same as mortar sand except all passing the No. 30 sieve.
- E. Water: Clean and fresh, from domestic potable source.
- F. Color Pigments: Pure ground mineral oxides, non-fading, alkali and lime proof, factory weighed and packaged.
- G. Mortar admixture shall be in accordance with manufacturer's instructions.

2.2 TILE MATERIALS:

- A. Standard Grade conforming to ANSI A137.1. Provide trimmer units as indicated and specified, including special shapes as detailed or required. Tile patterns and colors shall be as indicated and specified, colors of approved shades. Provide tile as manufactured by Dal-Tile, American Oleans, or approved equal.
- B. Mounting systems:

1. Mesh mounted or perforated paper backed tile is not allowed where the mesh of paper remains as a permanent part of the installation.
2. Clearface mounting system is acceptable.

C. Unglazed Ceramic Mosaic Tile:

1. Type: Porcelain unglazed ceramic mosaic tile, cushion or all-purpose edges, 2-inch square unless otherwise noted.
2. Tile shall be frost resistant.
3. Tile color shall be light in color, or as noted on the contract plans.
4. At all edges a bullnose tile shall provide a safe and smooth transition.
5. If a gutter is utilized 1-ft of tile shall be installed on both the “wet” and “dry” sides of the gutter. Color shall be a light color and match the plaster finish.

D. Glazed Ceramic Mosaic Tile:

1. Type: Porcelain glazed ceramic mosaic tile, cushion or all-purpose edges, 2-inch square unless otherwise noted.
2. Tile shall be frost resistant.
3. Tile shall be located at the waterline on skimmer pools or just below the stainless-steel gutter as indicated on the plans.
4. Tile color shall be as noted on the contract plans or selected by the Architect.

- E. Universal ‘No Diving’ Symbol: Provide 6-inch by 6-inch non-skid ceramic tile with universal ‘No Diving’ symbol. Lettering shall be a contrasting color, with a minimum letter height of 4-inches. Provide at all locations indicated on plans.

2.3 SETTING BED MORTAR:

- A. Machine mix mortar after dry mixing materials. Mix mortar not less than 5 minutes after water is added. Accurately measure materials using calibrated measuring boxes; shovel measurement is not permitted. Discard mortar, which is not placed and compacted before initial set. Measure materials by volume. Setting bed mortar: Factory blended Laticrete 3701 Fortified Mortar bed mortar mix as manufactured by Laticrete International or approved equal. The mortar shall be weather, frost, and shock resistant. TCA rating: heavy duty. Follow manufacturer’s instructions.

2.4 BOND COAT:

- A. Bond coat shall be Laticrete 254 Platinum or approved equal. The setting mortar shall be water-resistant, weather, frost and shock resistant. TCA rating, extra heavy duty. Follow the manufacturer’s instructions.

2.5 TILE JOINT GROUT:

- A. Grout shall be Laticrete Spectralock Pro Premium grout or approved equal:
1. Rated for use in swimming pools
 2. Stainproof
 3. Non-sag
 4. Have a uniform color
 5. Does not require sealing
 6. Is cleanable
 7. Meets performance requirements of ANSI A118.3, ISO 13007-3 RG and EN 13888
 8. Can be installed in a range of temperatures.
 9. Grout joints can be installed from 1/16” to 1/2”.
 10. Durable and crack resistant
 11. Commercial grade

2.6 TILE JOINT ELASTOMERIC SEALANT:

- A.

Use Laticrete Latasil over Laticrete Latasil 9118 primer silicone sealant for inside/outside corners, expansion/movement joints, and to seal lighting/plumbing fixture penetrations. The primer and sealant installation must be in accordance with the manufacturer's requirements.

2.7 DEPTH MARKERS

- A. The depth of the water shall be plainly marked at the pool's edge, at maximum and minimum points of break between the deep and shallow portions and at 2-foot increments of water depth. Depth markers shall be in numerals of 4-inches minimum height.
- B. Depth markers around perimeter of pool, as required: Black lettering on white, non-skid surface.
- C. Deck contractor shall install ceramic tile depth markers at appropriate locations as required by code.

PART 3 - EXECUTION

3.1 INSPECTION BEFORE INSTALLATION

- A. Tile installer shall inspect and verify job conditions. Report all defects in base surfaces for correction before proceeding.

3.2 PREPARATION

- A. Clean substrates of dust, dirt, oil, grease and deleterious substances and mechanically roughen concrete and shotcrete for bond. Conform to applicable Reference Standards and to recommendations of manufacturers of materials used.
- B. Substrates to Receive Mortar Setting Beds: Keep cementitious backing damp for at least 8 hours and scrub with neat Portland Cement slurry just prior to placing setting bed mortar.
- C. Tile Wetting: Dampen tile according to above Reference Standards or tile manufacturer's instructions, as required.
- D. Screeds: Accurately set temporary screeds to control the finish plane of mortar-bed set tile and remove as soon as setting bed is sufficiently hardened. Fill void spaces from screeds with same mortar.

3.3 TILE INSTALLATION

- A. Arrange tile according to patterns detailed. Set tile with flush well-fitted joints, finished in true planes, plumb, square, joints of uniform size. Provide approved trimmers as shown or required. Cut tile without marring. Carefully grind and joint tile edges and cuts.
- B. Mortar Bed Set Tile: Follow Tile Council of America Installation Method to achieve total tile system thickness for Thin or Thick-Set. Apply specified setting bed mortar on fresh Portland Cement slurry coat, tamp and screed to required planes. Spread no more mortar than can be covered with tile before initial set. Do not use retempered mortar. Trowel 1/32-inch to 1/16-inch thick bond coat over plastic setting bed mortar just before setting tile or apply bond coat to back of each tile placed. Set tile in position and beat firmly into the setting bed mortar. Bring tile faces to a true and correct plane. Complete all beating and leveling before mortar sets and in no case later than one hour after first placing. When ready, wet and remove paper and glue avoiding excess water. At this time adjust any out-of-line or out-of-level tile.
- C. Joint Size: Install tile with uniform 1/16-inch joint width.
- D. Ceramic Tile Joint Grouting: Grout tile joints full after washing out and saturating with clean water. Mix grout with water to a thick creamy consistency and force into joints for entire thick depth, flush with

surface. Clean off all excess and fill skips and gaps before grout sets. Use white grout between black tiles with black grout, and grout between other colored tiles with grout matching approved submittals. Provide dampness for minimum 3-day curing and polish with clean dry cloths.

E. Movement Joints:

1. Locations
 - a. At all breaks in plane (inside and outside wall corners, base of wall, top and bottom of dive well transition slope, stair nosing, and tread to riser inside corner).
 - b. At edges (tile to stainless steel gutter, tile to coping, tile to main drains, etc.).
 - c. Coincident (overlying) all joints (if any) including construction joints, control joints, or expansion joints in the concrete pool shell.
 - d. At no less than 15-foot spacings on all surfaces (floors and walls) in both directions.
2. Width: All joints shall be ¼” unless indicated otherwise.

3.4 POST-INSTALLATION CARE

- A. Filing of pool. Fill rate shall not exceed 1.25 inches per hour.
- B. Heating of pool. Temperature rise shall not exceed 2 degrees F per hour.
- C. Impact and immersion- Prohibit walls from impact, vibration and heavy hammering on adjacent and opposite walls for 14 days after installation, unless manufacturer’s instructions allow a shorter period. Protect from stain-causing chemicals for at least 14 days. Protect from total water immersion for at least 21 days after installation.

END OF SECTION 09 34 13

SECTION 11 66 43 - TIMING SYSTEM FOR SWIMMING POOL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The work specified in this section consists of furnishing all labor, equipment, tools, materials and services, and performing all the operations in connection with all excavation necessary to complete this project, regardless of excavation, which may be required for other structures forming a part of the project shown on the drawings and specified herein.
- B. Electronic timing and scoreboard system with multi-sport capability used for practice pacing and instruction, competitive swimming events, diving, water polo, and synchronized swimming.
- C. Starting system should be able to be integrated with electronic timing, relay judging platforms, and scoreboard system.
- D. All in-deck plates shall be furnished and installed by Other.
- E. All in-deck junction boxes, power, data boxes, wall boxes, and conduit shall be furnished and installed under the work of Division 26 - Electrical.

1.2 RELATED WORK

- A. Section 13 11 00 - Summary of Work for Swimming Pool
- B. Division 26 - Electrical

1.3 QUALITY ASSURANCE

- A. For indoor use
- B. Source Limitations: Obtain each type of timing and display equipment through one source from a single manufacturer.
- C. ETL listed to UL Standards 48 and 1433.
- D. NEC compliant
- E. FCC compliant
- F. ETL listed to CAN/CSA 22.2

1.4 REFERENCES

- A. Standard for Electric Signs, UL-48, 13th Edition

- B. Standard for Control Centers for Changing Message Type Signs, UL-1433, 1st Edition
- C. Standard for CAN/CSA C22.2
- D. Federal Communications Commission Regulation Part 15
- E. National Electric Code

1.5 SUBMITTALS

- A. Product data: Submit manufacturer's product illustrations, data and literature that fully describe the timing equipment proposed for installation.
- B. Shop drawings: Submit mechanical and electrical drawings.
- C. Maintenance data: Submit manufacturer's installation, operation, and maintenance manual.
- D. Warranty information

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Product delivered on site.
- B. Scoreboard and equipment to be stored in a clean, dry environment.

1.7 PROJECT CONDITIONS

- A. Manufacturers proposing to submit a quotation for the electronic timing and scoreboard system must confirm that all embedded items are compatible with the installation of their respective systems. Proposed system must integrate with existing equipment when present.
- B. Manufacturers shall review the construction documents and shall notify the architect 10 (ten) days prior to the bid date of conflicts or additions to the work of other subcontractors for the proper installation of their system.
- C. Environmental Limitations: Do not install display 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.
- D. Field Measurements: Verify position and elevation of floor inserts and layout for display equipment. Verify dimensions by field measurements.
- E. Verify support structure can support the scoreboard's weight in addition to any auxiliary module.
- F. Verify that all box layouts and conduit runs coincide with manufacturer's recommendations.

1.8 WARRANTIES

- A. Contractor shall warrant the completed installation of all systems in this section for one year.

- B. Manufacturer shall warrant the scoreboard, starting system, pace clocks, GEN7 serial timer for 2 years, touchpads for 2 years. The titanium deck plates have a 5 year warranty.
- C. Timing system manufacturer must supply first meet support to be scheduled with the manufacturer and the Owner.
- D. Provide an exchange program to supply replacement parts for components that fail during the coverage period. To minimize downtime, the exchange parts will be shipped on the same day the order is received or on the following day.
- E. Provide access to a local Authorized Service Company.
- F. Provide a help desk staffed by experience technicians and coordinators who are thoroughly familiar with the scoreboard and available for technical support. This staff must be available at no additional cost to the customer and provide an "on-call" service during weekends.

1.9 ACCEPTABLE MANUFACTURERS

- A. Colorado Time Systems, Inc., 1551 E 11th St., Loveland, CO 80537, 800.279.0111
- B. Or approved equal.

PART 2 - PRODUCTS

2.1 GENERAL DESCRIPTION

- A. All timing connection points shall employ the following
 1. The timing system shall employ topography of one communication bus to which all timing and connectivity nodes are connected and communicate with each other.
 2. Connection points shall be production items and not a one off or prototypes.
 3. Titanium contacts as exposed connectors are wet pluggable and electrically passive if not connected. No maintenance for corrosion shall be needed.
 4. Self-test capabilities to detect compromised timing bus wire terminations and scoreboard bus wire terminations.
- B. Shall be as indicated on the drawings.

2.2 TITANIUM SERIAL DECK PLATES – 1.5” CONDUIT

- A. Deck plates (6) required to permit plug-in connection for touchpads, A/B/C backup buttons, electronic relay judging, start light signal, start speakers, and a signal to start the timing device at each lane.
- B. Each deck plate to be mounted flush with deck tile or horizontally with deck tile to smooth edges and prevent injury to swimmers.
- C. Deck plate shall be made of material resistant to long term pool water exposure and shall be maintenance free other than normal power washing.

- D. Deck plate shall have topography that protects connectors for touchpads, backup buttons, electronic relay judging, start light signal, and start speakers by directing splash water to flow off to limit electrolysis.
- E. Connection to timer shall allow for pool setup without a wall plate.
- F. Titanium contacts as exposed connectors, wet pluggable, and electrically passive if not connected.
- G. Detection of presence or absence of connected timer.
- H. Self-test capabilities to detect anomalies with connectors (corrosion/shorts).
- I. Deck plates shall have recessed lettering that does not fade or get mechanically removed.
- J. Deck plate shall be intelligent and have diagnostic capabilities.
- K. Titanium deck plate shall fit into a 4" x 4" x 6" Carlon junction box placed in deck and they should have water drainage capability in each box. Junction boxes shall be interconnected with 1.5" (inch) PVC conduit. For bulkhead deck plates, provide 4.5" access hole.
- L. Recommended junction box - Carlon - Model #E989NNR-CAR or equivalent.
- M. There is no substitute for this timing component connection system.

2.3 TITANIUM START SYSTEM DECK PLATES

- A. Start system deck plates (1) connects start system into in-deck system.
- B. Start system deck plates must have built in diagnostics to detect anomalies with connectors (corrosion, shorts) and anomalies with the speaker or start system at setup and during use.
- C. Start system deck plates must have titanium connectors, and be wet pluggable and electrically passive if not connected.
- D. Inputs/outputs for start system and speaker.
- E. Detection of presence or absence of speaker or start system.
- F. Self-test capabilities to detect compromised timing bus wire terminations.
- G. Must be maintenance free other than normal power washing.

2.4 TITANIUM SERIAL WALL PLATE TIMER AND SCOREBOARD CONNECTIVITY 1.5" CONDUIT
QTY (2)

- A. Wall plates must allow for all required connections.
- B. Connection to timer and shall provide the following:
 1. Connectivity to all timing courses and one scoreboard bus with one cable connection.
 2. Detection of presence or absence of connected timer.
 3. Diagnostic capabilities to detect anomalies with connectors (corrosion, shorts).

- C. Connection to a scoreboard shall provide the following:
 - 1. Detection of presence or absence of connected scoreboard.
 - 2. Self-test capabilities to detect compromised timing bus wire terminations.
- D. Wall plate timing system components shall fit into an 12" x 12" x 6" PVC junction box. Acceptable manufacturer, Carlon (P/N 989R) or similar box.
- E. All conduit interconnects between timing system boxes (deck plates and wall plates) shall be 1.5" PVC.

2.5 CHAMPIONSHIP START SYSTEM - STANDARD (SS) QTY (1)

- A. A single cable from wall plate to start system shall carry signal for driving up to 20 individual block speakers, 20 individual Relay Judging Platforms with Speedlights, external strobe(s), and external speaker(s).
- B. System shall use wired microphones and shall have a volume control on each microphone input.
- C. Start system shall have a sturdy, all metal, non-corrosive enclosure, legs and tripod mount (TR-3) Qty (1)
- D. System shall have external connections for additional strobe light(s), speaker output, start output, and Speedlights.
- E. System shall run from external 12-volt/AC power adapter and have two (2) internal Gel cell batteries. The internal batteries will automatically be recharged while the start system is plugged in to the external power supply.
- F. There will be an LED warning light on the system showing when the internal batteries are starting to get low on power.
- G. Provide (7) SP-6/45 (6 watt, 45 ohm) reflex corrosion-resistant speakers with cable (one for under each starting block).
- H. Start system must be compatible with underwater speaker system (SP-UND).
- I. Provide (1) 8M Start Cables.

2.6 AUXILIARY SPEAKERS - SP-125 (1)

- A. Auxiliary speakers shall be 40-watt 8ohm. Auxiliary speakers' output level shall be fully adjustable.

2.7 TIMING SYSTEM (GEN7 SWIM TIMER) QTY (1)

- A. Timer shall be a standalone unit with physical connections to timing inputs. Timer shall be controlled by user interface device (computer or tablet) via USB or network.
- B. Timer interface (computer or tablet) shall be supplied with all necessary software to time and score swimming in compliance with the appropriate sanctioning body(ies): FINA, NCAA, YMCA, USA Swimming, and National Federation of High Schools.

- C. Timer shall accept inputs for up to 12 lanes for a parallel wiring (legacy) installation and up to 32 lanes for a serial wiring installation.
- D. Timer shall time to a user-selectable resolution from 1 second to .001 second. It shall take starts and finishes from the near end and/or far end of the pool. It shall accept inputs from the start system, touchpads, up to three manual backup times per lane, and relay judging platforms.
- E. Timer shall be capable of performing system diagnosis, including the detection of corroded or partially shorted inputs and shall alert the user when inputs are no longer within acceptable tolerances.
- F. Timer shall run off of a 12 Volt power supply connected to a standard 110/240 VAC outlet and will automatically switch to (and display on screen of connected interface device) internal battery source power, in case of line power failure without affecting the continuity and accuracy of the timing system.
- G. Timer shall interface to single- and multi-line scoreboard and shall post immediate results to scoreboard in "Lane" or "Place" order (user selectable). The timer shall also have the capability to pull race results from memory and post those results to the scoreboard in "Lane" or "Place" order (user selectable).
- H. Timer to include internal clock calendar with self-sustaining battery to time/date stamp all results.
- I. Timer shall meet acceptable safety standards. Shall be ETL approved, or equivalent.
- J. User interface shall display complete race status. The interface shall be capable of functioning as a miniature scoreboard displaying information simultaneously for all active lanes including lane number, current length in race or final place, split or finish time, relay judging status indicator, and backup time and backup button status.
- K. All race data, including near and far end splits, shall be stored to internal memory for later recall to facilitate meet management connectivity and printing. Printed reports shall include cumulative and subtractive splits as well as relay judging times (when required).
- L. Backup timing provides backup time via push button provided on a per lane basis should swimmer fail to trigger touchpad or touchpad fails to register. Timer to be capable of accepting up to three backup button times per lane.
- M. Meet memory shall be capable of being transferred to external storage (via USB) or cloud data backup services (i.e. DropBox, Google Drive, etc.).
- N. Relay judging automatically compares the touchpad hit of an incoming swimmer with the starting swimmer's time of departure from the optional relay judging platform. Results display both "plus" and "minus" takeoff times and can be printed and stored in race memory.
- O. Timer shall communicate with meet management peripheral software on a two-way "handshake" basis, enabling the meet manager's resident computer to query the timer's memory via the USB port or via the network at any time for any race results.
- P. The system's Automatic Event Sequencer shall be capable of holding both standard and user defined event sequences. The event order will be able to be downloaded from meet management software. The desired order is user selectable. EVENT SEQUENCES with appropriate race distance and race description for high school, college meets, and two "User Defined" meets to permit construction of custom meets. USA Swimming, YMCA, and FINA. When recalled from memory, race distance and descriptions are automatically selected for the operator.

- Q. Timer shall automatically flag timing discrepancies (in the user interface, on the results printouts, and in stored memory) greater than .30 seconds between touchpad and backup times.
 - R. Timer shall have touchpad delay feature with ability to program delays from 1 to 99 seconds.
 - S. The user interface software shall permit operation of essential functions including Lane Off/On, Finish Arm, Split Arm, and Print Results directly from the main screen to ensure speed and simplicity of operation during critical race times. The interface shall permit the operator to insert a backup time when required (edit) or to disqualify (DQ), automatically posting it to the scoreboard, and provide automatic re-ranking of results. Any corrections generated by the operation (edit or DQ) shall be clearly identified on the results printouts.
 - T. The user interface shall permit the operator to correct for an erroneous touch by adding/subtracting a touchpad hit to correct the lengths completed. The interface shall not permit the operator to finish a race in any lane; timers including such a function are unacceptable because they permit the possibility of cheating.
 - U. Timer shall include electronic beeper and LED signaling to indicate touchpad, backup button, and relay judging inputs. Timers which do not allow the user to configure (enable/disable) this feature are unacceptable.
 - V. Timer connectivity shall include:
 1. USB (Type A) port for external storage.
 2. USB (Type B) port for meet management connectivity.
 3. USB (Type B) port for user interface computer connectivity.
 4. Ethernet port for network connectivity.
 5. WiFi (as available option) for wireless network connectivity.
 6. Three (3) independent scoreboard output ports.
 7. For parallel (legacy) wiring systems, redundant near and far end connections timing inputs (touchpads, backup button, relay judging platforms) for up to 12 lanes.
 8. For serial wiring systems, connection for in-deck wiring and two connections for on-deck (near and far end) wiring.
 - a. Serial in-deck can accommodate up to 32 lanes near and far end, on-deck can accommodate up to 20 lanes near and far end.
 9. Start system connection directly to timer.
 10. External DC power port.
 - W. Timer shall be capable of updating internal software/firmware via Internet connection.
 - X. Timer software shall have the ability to adjust the intensity of LED scoreboard brightness.
 - Y. When recalled from memory, race distance and descriptions are automatically selected for the operator.
- 2.8 AQUAGRIP TOUCHPADS (TP-78G)
- A. Touchpads shall be 78 inches wide x 22 inches tall x .3 inches thick. Provide (8) touchpads.
 - B. Touchpads shall be integrated to the timing system using in-deck wiring to a wall plate connection.
 - C. Touchpads shall be constructed of an all-plastic exterior with only the electrical connector metal exposed. Stainless steel will not be acceptable in pool environment.

- D. Touchpads shall have a uniform fine grit, non-abrasive surface that prevents swimmer slippage in any direction.
- E. Touchpad markings shall have contrasting colors with a 2" black border and black end-wall cross pattern for portion covered by touchpads.
- F. Touchpad brackets shall be custom made to fit the pool gutter system. Diagram required upon placement of order.
- G. Touchpad caddy for storing touchpads supplied shall be (1) CAD-TP/P.
- H. TP-GEN7-6- includes (1) (6)-lane harness, (7) push buttons, TPMD and VP-2.
- I. Provide nine (7) additional PB-6 push buttons for backup timing.

2.9 THREE JUDGE DIVING SCORING SYSTEM

- A. Diving Scoring System shall utilize scoreboard to display diving scores and results without modification from swimming configuration.
- B. Diving Scoring System Software shall:
 1. Diving Scoring System Software shall support standard and synchronized scoring.
 2. Accept three judges' input scores and compute award based upon proper formulas for three judges. Software shall be operable with either remote judges' terminals or manual input of flash card scores.
 3. System must be expandable to use up to eleven judges scoring terminals.
 4. Permit display of the lead diver number, current diver number, dive number, degree of difficulty, judges' scores and diver's calculated award and total score.
 5. Permit entry of all diving data into non-volatile memory for storage or receive data from meet management computer without additional modifications. Data shall include diver number, round number, dive number, and position. Degree of difficulty shall be automatically calculated based upon dive number per current FINA/USD/NCAA/High School regulations. Dive degree of difficulty can also be manually input.
 6. Automatically recall the diver with round number, dive number and DD using minimal keystrokes. Systems which require live entry of dive information are unacceptable.
 7. Permit storage of diver's point totals and provide ranking of the divers at the end of each round.
 8. Permit editing of judges' scores if required by meet officials.
 9. Provide an output for computer data handling of diving events.
 10. Permit two point deduction from the judges' scores and zero points for a failed dive. Such changes shall be clearly shown on the printout.
 11. Printout shall provide preliminary data, diver ranking by rounds, and results of individual dives with judges' scores.
 12. Judges' terminals shall be housed in sealed, water-resistant, shockproof housing.
 13. The terminals shall provide a signal to inform the judge that the diving console has requested a score. Signal shall cease when an appropriate score is transmitted. They shall also allow each judge to input a score with a minimum of keystrokes, review that score via a built-in LCD display, and correct a score if needed before transmitting to the Judging Software.
 14. The Software shall provide a switchable mode for sending data to the scoreboard display.
 - a. Mode- Automatic- In this mode the software must send the judges scoring information to the display with no software operator interaction.

- b. Mode- Hold for Authorization – In this mode the software must receive authorization from a referee terminal or an assistant referee terminal prior to sending the scoring data to the display.

- C. Remote judging terminal and interface shall be as follows:
 1. Interface hub shall plug into the PC via USB 2.0 or greater
 2. Judges terminals shall include a quick release mating connector for connection to the Diving Cable Breakout Box.
 3. Judges' terminals shall include rugged communications cable to connect to the diving interface box. Cable should be removable for easy cost effective replacement of the cable.
 4. Judges' terminals shall utilize sealed keyboards with a 128x64 Pixel Backlit LCD display suitable for indoor and sunlight readability.
 5. Judges terminal LCD must be capable of displaying Divers Name.
 6. Judges terminal LCD must be capable of displaying Divers Team or Country Name.
 7. Judges terminal LCD must be capable of displaying scores of other judges once the scores have been accepted.
 8. Judges terminal LCD must be capable of displaying Dive and Dive Degree of Difficulty
 9. Judges terminal LCD must be capable of displaying the Terminal Number so they can be easily identified to the judge
 10. Judges terminals shall include a request change button to notify the software that the judges input is requesting permission to correct the submitted score.
 11. Judges terminals must be able to be assigned as a Referee's terminal or Assistant Referee's terminal allowing the device to control when the judging data is transmitted to the scoreboard display.
 12. Provide three Judging Terminals (JT-01) with associated cables. Provide one interface hub box (IH-01) with associated cables. Provide one cable breakout box (CB-01) with associated cables

2.10 GEN7 PACE CLOCK PROGRAM

- A. Accessory software program shall turn multi-sport computer and multi-sport scoreboard into an effective training system and coaching tool.
- B. Interface to HYTEK's "Workout Manager" software with direct download to computer timer.
- C. Programmable workouts are saved into memory for up to 80 workouts.
- D. Workouts display on multi-line scoreboard by lane.
- E. START/STOP all lanes with one keystroke, or individually.
- F. Include programmable "fudge factor" for coaches' election.

2.11 4-DIGIT SLIM PACE CLOCK/TIME OF DAY CLOCK (SP-1400) Qty (2)

- A. Slim pace clock must have integrated real time of day chip.
- B. Red or amber LED digits shall be 13" in height.
- C. Slim pace clock shall have integrated 2.4GHz wireless with 12 operating channels to eliminate interference and synchronize time automatically with other slim pace clocks within the facility.

- D. Digits and circuitry must be conformal coated to protect against corrosion.
- E. LED digits must have variable intensity setting.
- F. Must be able to be used for either pace clock or time of day clock (hours and minutes or minutes and seconds).
- G. Enclosure shall be rugged, powder-coated aluminum.
- H. High gain flush mount patch antenna will be mounted on an LED digit and protected by a Lexan cover to prevent breakage by errant balls and/or weather.
- I. 4-digit slim pace clock dimensions (H x W x D) 19.25" x 42.25" x 2.8"
- J. 4-digit slim pace clock shall be able to be used as a segment timer with the WHC-2 for training purposes.
- K. Suitable for indoor or outdoor use.

2.12 WIRELESS HANDHELD CONTROLLER FOR SEGMENT TIMER (WHC-2) Qty (1)

- A. Wireless handheld controller shall allow operator to program
 - 1. Up to 10 programmable sets
 - 2. Reps
 - a. Up to 50 programmable reps for each set
 - b. Hours can be set from 0 – 99
 - c. Minutes can be set from 0 – 99
 - d. Seconds can be set from 0 – 99
 - e. Each rep can be set to count up or count down
 - f. Beep can be programmed from 0 – 9 seconds
- B. WHC-2 shall be capable of operating 2.4GHz slim pace clocks (SP-xxxx) and deck clocks (DC-1500)
- C. Wireless handheld controller shall be capable of selecting a specific wireless scoreboard address to send data to.
- D. WHC-2 shall run on (2) AA alkaline or rechargeable batteries.
- E. Wireless handheld controller shall have an operating distance up to 1,000 ft.
- F. Wireless handheld controller display must be transfective LCD screen that is easily readable in all environments from darkness to bright sunlight.
- G. Wireless handheld controller shall operate on 2.4GHz wireless and be FCC, CE, and RoHS compliant.
- H. Wireless handheld controller shall be 3.0" x 1.4" x 4.6" (W x H x D).

2.13 WIRELESS PACE CLOCK PRO (PCW-PRO)

- A. Provide (1) portable pace clocks with (4) 10" LED digits (red or amber).
- B. Unit with digits less than 10" will not be accepted due to inadequate viewing distance.

- C. Pace clock shall have a minimum of 15 LED intensity settings, and the capability to adjust the LED intensity using a System 6 console or via the control panel.
- D. Wireless pace clock shall have a minimum of 8 channels of wireless communication in the 900MHz or 2.4GHz spectrum, with a minimum indoor line of sight communication range of 500 ft.
- E. Wireless pace clocks shall have the capability to be set up as "master" or "slave."
- F. Wireless pace clock set as "master" must re-transmit pace clock data to "slave" pace clocks set to receive data on the same frequency.
- G. Pace Clock Pro electronic training device shall be provided, enabling swimmers to perfect their starts, relay exchanges, and turn speeds.
- H. Pace clock shall have the capability of being programmed by a handheld console for pacing functions. Additionally, it shall be capable of being programmed with the timing console.
- I. Pace clock shall operate on AC power or two internal rechargeable 12 volt Gel cell batteries. The internal battery will automatically be recharged while the clock is plugged in to the external power supply.
- J. Pace clock shall have a battery life of 6 hours/internal rechargeable battery.
- K. Pace clock shall have the capability of being located anywhere on the deck, mounted on a wall, or recessed within a wall.
- L. Pace clock shall have 5 ports to operate in conjunction with the following equipment: push button(s), relay judging platforms, start system, and two touchpads.
- M. Pace clock shall be capable of performing 15 training modes: (additional equipment may be required for some functions)
 - 1. Lap counter
 - 2. Simple pace clock
 - 3. Pace clock with cumulative splits
 - 4. Pace clock with lap splits
 - 5. Relay exchanges
 - 6. Start reaction
 - 7. Turn speed
 - 8. Breakout time
 - 9. Start reaction & breakout time
 - 10. Five single-lane timing modes
 - 11. Mid-race timing

2.14 SCOREBOARD SYSTEM (6 Lane LED-R) (1)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify that surfaces which scoreboard will be mounted on are ready to receive work. Verify that placement of conduit and junction boxes are as specified and indicated in plans and shop drawings.
- B. All power and control cables to scoreboards and displays will be concealed in wall in conduit or connected to their associated female wall outlets or jacks. Power will be connected to the scoreboards/displays as well as raceways shown on electrical plans by the Electrical Contractor. Scoreboard control wiring coiled cable to the bleacher jack location will be the responsibility of the contractor assigned the scoreboard equipment.
- C. Mount scoreboards and interior displays to wall in location detailed and in accordance with manufacturer's instructions. Unit shall be plumb and level.
- D. Install control center.
- E. Provide boxes, cover plates, and jacks in locations per plans for remote operation of control cables to control panel. Jacks will be concealed in wall or under floor in conduit.
- F. Test connect control unit to all jacks and check for proper operation of control unit, scoreboard and all features. Leave control unit in carrying case and other loose accessories with owner's designated representative.

- G. Conduit operator training on the scoreboard/controller operation.

3.2 EXISTING CONDITIONS

- A. Verify that all work by others, related to this section, is installed.
- B. Carefully examine all of the construction documents that affect the work of this section.
- C. Prior to starting work, notify the Architect and General Contractor of any defects requiring correction.
- D. Protect other materials and installed work against damage while completing work in this section.

3.3 INSTALLATION

- A. Furnish and install all custom cables, connectors, scoreboard mounting brackets, and fasteners.
- B. Owner or contractor will provide lift and (2) laborers for mounting scoreboard and pulling cables.
- C. Furnish and install equipment in accordance with the manufacturer drawings and instructions.
- D. Provide scoreboard mounting, all timing system cable terminations, system checkout, and a local operator training at the time of installation. Training shall consist of one 8-hour session at time of installation.
- E. Provide as-built drawings precisely locating all items.
- F. Wiring and grounding shall be installed in strict accordance with the latest edition of the National Electric Code.

END OF SECTION 11 66 43

SECTION 13 11 00 - SUMMARY OF WORK FOR SWIMMING POOL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide complete filtration and chemical feed systems.
 - 1. Pool system equipment shall be located as indicated on the contract drawings.
- B. Provide field layout of pool. Benchmark and exact location shall be by General Contractor.
- C. Furnish and install prefabricated suction outlet fitting assemblies, inlets, and recirculation systems. All systems shall be VGBA-compliant. Specified in Related Work.
- D. Furnish and install complete pool filtration and chemical treatment equipment, including fittings, piping and valves as required for fully operable systems. Specified in Related Work.
- E. Furnish and install all pumps, piping, fittings, and valves as required for operation of recirculation system. Specified in Related Work.
- F. Furnish and install safety and rescue equipment, ADA pool lift, and maintenance equipment. Specified in Related Work.
- G. Furnish and install nonslip deck depth markers and "No Diving" signs as required by code, ceramic tile for installation on pool gutter, and custom signs to be installed on the deck walls and enclosure surrounding the pool as specified. Marker font and style shall be in accordance with project requirements.
- H. Furnish and install pool fittings to: pit drains, potable water supply to pool, and pool wastewater disposal. (Contract limit line will be at air gap between pool system and potable water supply and sewer).
- I. All necessary sleeves, openings, or other penetrations in equipment room walls, pump pits, settling tanks, etc.; and closure of same required for pool construction work.
- J. Furnish and install collector tank. Contractor shall coordinate elevation of the tank with General Contractor.
- K. Coordinate any plumbing or drainage connections to the collector tank or any filtration system.
- L. Provide signage in filter or equipment rooms required or recommended by OSHA to alert operators of the possible hazards in the area.
- M. Hoisting and rigging equipment into their final location.
- N. Coordinate all piping penetrations and pipe routing.
- O. Coordinate all electrical, mechanical, plumbing, and site connections with other trades to ensure equipment provided will be compatible with the existing or proposed conditions.
- P. Coordinate and perform filling the swimming pool. Water used for filling will be provided by Owner. Prior to filling the pool, the water shall be confirmed clean without rust or other minerals that might stain or damage finished surfaces.

- Q. Furnish and install safety and rescue equipment, handicap lift, and maintenance equipment (Specified in Section 13 11 46 DECK EQUIPMENT AND ACCESSORIES FOR SWIMMING POOL).

1.2 RELATED WORK

- A. Section 03 11 00 - Concrete Formwork for Swimming Pool
- B. Section 03 21 00 - Concrete Reinforcement for Swimming Pool
- C. Section 03 37 13 - Shotcrete for Swimming Pool
- D. Section 03 48 00.13 - Precast Concrete Structures for Swimming Pool
- E. Section 07 92 00 - Waterstops and Sealants for Swimming Pool
- F. Section 09 34 13 - Tile for Swimming Pool
- G. Section 11 66 43 - Timing System for Swimming Pool
- H. Section 13 11 00.16 - Equipment for Swimming Pool
- I. Section 13 11 00.19 - Ultraviolet System for Swimming Pool
- J. Section 13 11 43 - Perimeter Overflow Recirculation System
- K. Section 13 11 46 - Deck Equipment and Accessories for Swimming Pool
- L. Division 26 - Electrical

1.3 WORK PERFORMED UNDER OTHER SECTIONS, NOT BY SWIMMING POOL CONTRACTOR (SPC)

- A. Site access for heavy equipment.
- B. Benchmark and exact pool location.
- C. Construction and waterproofing of the proposed pool pit and leveling slabs.
- D. Construction of the pool equipment room and required equipment pads.
- E. Deck construction, finishes, expansion joints, caulking, drains, etc., installation of anchors (furnished by SPC) for deck equipment.
- F. Furnish and install deck drains and filter room drains as shown on plans. Refer to architectural drawings.
- G. All caulking adjacent to the pool and recirculation systems.
- H. General construction work that is not included in this Section.

- I. The plumbing contractor shall provide potable water piping to the mechanical room and provide shut-off valve, hose bib, eyewash station, and makeup water line to pool fill location. The makeup water line shall include a backflow prevention device.
- J. The plumbing contractor shall provide sanitary waste piping to the mechanical room and pool area including floor drains, deck drains, and wastewater accommodations for draining the pool and cleaning the filter system.
- K. Install solenoid valves, water connection to cylinder-operated valves. Automatic fill system shall be found in the pool equipment room.
- L. Provide access to filter room for filter access.
- M. All electrical connections shall be by the electrical contractor; the SPC shall provide the filter, pumps, motors, solenoids, relays, water level probes (with housing), motorized valves, etc., as shown on plans. All controls including starters, shall be provided and installed by electrical contractor; the electrical contractor shall install and wire all electrical equipment furnished by the SPC and shall provide all disconnect switches as indicated or required by code. Chemical feeders shall be electrically interlocked with filter pumps.
- N. The electrical contractor shall bond and ground the entire pool structure, deck, and equipment in accordance with the national electrical code and all local codes and ordinances.
- O. Provide adequate ventilation for equipment as specified by the manufacturer.
- P. Provide all construction utilities, water, electric heat, or cold weather protection.

1.4 QUALITY ASSURANCE

- A. Design Standards
 - 1. Within the limits of constraints imposed by existing conditions, it is intended that the work of this contract shall comply with the following requirements:
 - a. International Swimming Pool and Spa Code; Latest Edition (ISPSC 2021)
 - b. American National Standard for Public Swimming Pools; Latest Edition (ANSI/APSP/ICC 1-2014)
 - c. American National Standard for Suction Outlet Fitting Assemblies (SOFA) for use in Pools, Spas, and Hot Tubs - Includes Provision Amendment Approved March 19, 2021 (ANSI/APSP/ICC-16 2017 (PA 2021))
 - d. Equipment and Chemicals for Swimming Pools, Spas, Hot Tubs, and Other Recreational Water Facilities (NSF/ANSI/CAN 50-2020)
 - e.
 - f. State of New York Bathing Codes; Latest Version.
 - g. National Electrical Code, Article 680; Latest Version.
 - h. National Sanitation Foundation Standards for Swimming Pool Equipment. (N.S.F.).
 - i. New York Building Code; Latest Version.
 - j. Virginia Graeme Baker Pool and Spa Safety Act (VGBA 2017)
 - k. United States Department of Justice - Americans with Disabilities Act (ADA)
 - l. Standards for main drains, ASME A112.19.8-2007/8A-2008.
- B. Experience Qualifications: SPC shall have been in business over 10 years under the current company name. Submit list of 5 projects, completed within the past four years, 3 of which can consist of current projects under construction. SPC shall submit a list of contacts on all the referenced projects.

- C. Installation of Pool System and Equipment: Work shall be performed by or under direct supervision of SPC supervisor with a minimum of 5 years' experience in construction and equipping of public pools and commercial pools of similar nature. Pool equipment and system shall be installed by specialists experienced in swimming pool work and licensed or approved by manufacturer to ensure installation and performance in accordance with manufacturer's warranties and guarantees.

1.5 SUBMITTALS

- A. Shop Drawings: Submit coordinated pool structural steel shop drawings, showing types of anchors and method of anchoring fixed equipment. Provide rough-in information interfacing mechanical and electrical work and accurately dimensioned locations for sleeves, inserts, and anchors to be cast into concrete and installed into the building structure. SPC shall submit on all materials to be supplied in the construction of this project, certifications, and resumes as stated in each section.
- B. Health Department: In accordance with the New York Department of Health regulations, submit plans, permit applications, and any other associated items for a complete health department submittal. The health department submittal shall bear a signed and sealed stamp for a registered professional engineer. SPC to bear any costs associated with permit fees.
- C. Certification: Submit complete equipment list and duplicate copies of certificate from equipment manufacturer, properly attested, with statement that materials meet requirements of Contract Documents. Submit certificate for approval before doing any work.
- D. Product Data: Submit manufacturer's data for operating equipment, valves, piping, drains, and equipment. Include roughing-in information for mechanical and electrical work. Product data shall be job specific. Generic submittals will be rejected.
- E. Maintenance Data: Submit two (2) sets of operating and maintenance manuals. Include operating instructions, maintenance recommendations for equipment and finishes, parts list, troubleshooting information, and similar data. Manual must be approved prior to training of Owner's personnel. The manuals shall be job specific to the item supplied for this job.
- F. Contract Documents: Drawings are diagrammatic in part and are meant to indicate general arrangement of systems and equipment. Information shown on plans but not on sections or schedules and vice-versa, shall be provided as if expressly required on both. It is not intended that Contract Documents indicate every fitting offset, line or component necessary for a particular supplier's system; but it is intended that systems and equipment supplied shall be complete and operational, whether or not shown or specified. Specified items may in fact be disapproved during Submittal Review if they do not form part of a complete system. SPC shall submit to the Engineer and Construction Manager their proposed piping and equipment layout for the proposed pool.
- G. If a discrepancy exists between technical drawings and written specifications, the SPC shall notify the General Contractor and the Engineer immediately for clarification.
- H. Permits: SPC shall be responsible for obtaining and paying for all permits, inspections, licenses and certificates required for work under this Section.

1.6 PRODUCT DELIVERY AND STORAGE

- A. Deliver material in manufacturer's original, unopened containers and crates with all labels intact and legible.

- B. Deliver materials in sufficient time and quantity to allow continuity of work and compliance with approved construction schedule.
- C. Handle materials in a manner to prevent damage.
- D. Store all materials on clean raised platforms with weather protective covering when stored outdoors. Provide continuous protection of materials against damage and deterioration.
- E. Remove damaged materials from site. Replace any materials that have been damaged during construction.

1.7 GUARANTEES

- A. Provide standard written manufacturers' guarantees in the Owner's name for materials furnished under this Section where such guarantees are offered in the manufacturers' published product data.
- B. Furnish written warranty for materials and workmanship of systems installed under this Section against defect in materials and workmanship for 1 year.
- C. The SPC warrants to the Owner that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized may be considered defective. The SPC's warranty excludes remedy for damage or defect caused by abuse, improper or insufficient maintenance, improper operation or insufficient maintenance, improper operation, modification not executed by the SPC or the Owner; the SPC shall furnish satisfactory evidence as to the kind and quality of materials and equipment. All warranties shall be for a minimum period of one year or the length of the standard warrantee, whichever is greater, from the date of Substantial Completion, unless otherwise specified.
- D. The SPC shall agree to repair or replace any defective work at no cost to the Owner, upon written notification from the Owner within the warranty period. Prorated warranties are not acceptable.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products of particular manufacturers have been specified to establish a standard of quality and performance.
- B. Proposals, including list of manufacturers and itemized products for other systems, will be reviewed by Engineer and General Contractor to determine their comparability to scope and quality required by Contract Documents.
- C. All equipment furnished hereunder shall be by manufacturers with at least 5 years' experience in the fabrication and installation of the item specified with at least 10 installations on public pools similar in scope to this project.

2.2 MATERIALS

- A. As specified for individual items in each Section.

PART 3 - EXECUTION

3.1 TESTING AND INSPECTION

- A. Test pool piping to 50-psi hydrostatic pressure for pressure piping and 10-psi for gravity piping, for a duration of two (2) hours before placement of covering concrete slabs or encasement. Pressure shall remain on piping until the commissioning of the filtration equipment. The Contractor shall pressurize the piping; if it is found with zero pressure the Contractor shall perform the test again at no charge to the Owner.
- B. Coordinate inspection services for all concrete and steel reinforcing, or any products that will be inaccessible for inspection upon completion of construction.
- C. Additional testing requirements as required by the contract documents.
- D. SPC shall startup, test, balance, and operate the pools until formal acceptance by the Health Department. SPC shall bear all expenses such as chemicals and labor maintaining the pools. SPC shall be the certified pool operator for the first year of operation of the pool.
- E. The SPC shall video record the startup and pool operation demonstration for future use by the Owner. This video shall be issued to the Owner via email, DVD, and a Flash Drive.

END OF SECTION 13 11 00

SECTION 131100.16 - EQUIPMENT FOR SWIMMING POOL

PART 1 - GENERAL

1.1 WORK INCLUDED:

- A. Furnish and install complete pool mechanical system as indicated on the drawings and as specified herein, including:
 - 1. The complete pool water filtration systems shall include the media, filter tank, internal collection and distribution system, vent, sight glass, face piping and valves, pumps and motors, chemical feed, and control equipment.
 - 2. Furnish and install collector tank/surge tank and equipment, fittings, hatches, ladders, float valves and isolation valves as required to plumb pool fittings, drains, features, and gutters through surge tank to pumps.
 - 3. Furnish and install main drain covers and perimeter overflow gutters.
 - 4. Furnish and install auto-fill systems, pool bonding (grounding), lighting system, and connections to sanitary systems.
 - 5. Furnish and install pipe, fittings and valves as required to connect chemical treatment equipment to pool system.
 - 6. Furnish and install pipe fittings and valves as required to plumb pool fittings, drains, inlets, fill and drain systems and skimmers to recirculation, filter, and backwash.
 - 7. Furnish and install Schedule 80 PVC pipe and fittings for all piping in the Pool, unless noted otherwise.
 - 8. Furnish and install all chemical feeders, storage tanks and chemical analyzers.
 - 9. Furnish and install precast concrete collector tank.
 - 10. Furnish and install pool heat exchanger system.
 - a. Connection to gas system and venting by others.
 - b. Connection to water supply by others.
- B. Final testing and demonstration to Owner.
- C. Provide system start up and operator training by a certified manufacturer's representative. Operator training shall occur until the Owner is satisfied with the training.
- D. Pool shall be operated and balanced by Contractor until an operation permit is issued by the Approving Authority.

1.2 RELATED WORK:

- A. Section 13 11 00, SUMMARY OF WORK FOR SWIMMING POOLS
- B. Section 13 11 00.19, ULTRAVIOLET SYSTEM FOR SWIMMING POOLS
- C. Section 13 11 46, DECK EQUIPMENT AND POOL ACCESSORIES
- D. Division 26 – ELECTRICAL

1.3 QUALITY ASSURANCE:

- A. Only suppliers/manufacturers who have established a proven record of performance with at least five (5) years of the specified filter fabrication shall be acceptable. System shall be fabricated and fully assembled in a Certified Manufacturing Plant. Filters must have proven filtration performance demonstrated by at least ten (10) swimming pools operating at least one year under normal loading conditions, which have consistently operated at least 25 days between media replacement or cartridge cleaning. Prime bidders are cautioned that the manufacturers' stock pressure sand filtration systems will be approved only if such system, in fact, meets all the material and performance requirements specified herein.
- B. The filter system shall meet all State and local Health code requirements.
- C. Due to the specialized nature of the work and products herein, the installation Supervisor of the Manufacturer shall be required to have a minimum of three (3) years of filtration installation experience and show at least five (5) installations of public-use pool filtration systems in successful operation for at least two (2) years.

1.4 REFERENCES:

- A. American National Standards Institute (ANSI) A108/A118/A136.1 - American National Standard for Installation of Ceramic Tile.
- B. American National Standards Institute/National Spa and Pool Institute (ANSI/NSPI) ANSI/NSPI 1 - American National Standard for Public Swimming Pools.
- C. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME) A112.19.8 - Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, and Hot Tubs, Includes Addenda A.
- D. ASTM International (ASTM):
 - 1. D1784 - Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
 - 2. D1785 - Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - 3. D2564 - Standard Specification for Solvent Cements for Polyvinyl chloride (PVC) Plastic Piping Systems.
- E. International Association of Plumbing and Mechanical Officials (IAPMO).
- F. National Fire Protection Association (NFPA) 70 - National Electric Code.
- G. National Sanitary Foundation/American National Standards Institute (NSF/ANSI) Standard 50 - Circulation System Components and Related Materials for Swimming Pools, Spas/Hot Tubs.

1.5 SUBMITTALS, IN ACCORDANCE WITH THE GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Submittals for Review:
 - 1. Product Data: Manufacturer's descriptive data, specifications, and installation instructions for:
 - a. Piping.
 - b. Filters.

- c. Pumps and strainers.
 - d. Variable Frequency Drives (VFD).
 - e. Heat exchanger
 - f. Chemical controller, Disinfection feeder, and pH feeder.
 - g. Valves.
 - h. Gauges, thermometers, control panels and flow meters.
 - i. Any permanent component on this system.
2. Performance Criteria: For products specified by performance criteria only, document conformance with design calculations or past performance records with list of previous installations and contact information.

B. Quality Control Submittals:

- 1. Certificates of Compliance: Submit certification that pool system complies with requirements of applicable codes, ordinances, rules, and regulations, ANSI/NSPI 1, and ANSI/ASME A112.19.8.

C. Closeout Submittals:

- 1. Operation and Maintenance Data: Include data for pool and pool equipment, and warranty information. Contractor shall supply four (4) complete Operation and Maintenance manuals for all products supplied in this project. The manuals shall be project specific; any general Operation and Maintenance manuals shall be rejected.
- 2. Maintenance manual shall have a complete system diagram displaying the valve number, valve function, on specific system, and how to operate the system opening and closing valves.
- 3. Warranties.
- 4. Owner's Certificate of Instruction.

1.6 DELIVERY, STORAGE AND HANDLING:

- A. Store pool system components off ground and protect with waterproof covering.
- B. Protect piping and accessories from exposure to ultraviolet and from contact with chemicals that could cause damage or deterioration.

1.7 WARRANTIES:

- A. Furnish filter and related items manufacturer's 1-year warranty against defective materials and workmanship, starting on the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EQUIPMENT:

A. Main Drain

- 1. Sumps shall be fabricated of high-density resin or 304L stainless steel. Sumps shall be fitted with waterproofing flanges, hydrostatic relief valves with collection pipes and tamper proof stainless steel cover grates. All Fittings should be of non-corrosive materials. Maximum opening of grates shall be 3/8-inch with total open areas as required to accommodate specified flow rate at velocity not to exceed 1.5 feet per second (fps). Load bearing capacity of grating as installed shall be at least 200 pounds per square foot.
- 2. Open area of grates shall be 212.89 square inches. Grates shall be Model No. MD-304-2424FC manufactured by Paddock or approved equal.

3. Furnish and install 24x24 main drain sump manufactured by MD-304-2424FC, Model No. Paddock, or approved equal.
4. The sump shall be a manufactured product, from the same manufacturer as the cover, where the sump and cover meet the standards set forth by the Virginia Graham Baker Act.

B. Filter

1. The filter system shall be a pressure Regenerative Media System consisting of one (1) carbon steel vertical tank housing that is NSF listed. The capacity of the filter will be 620 gallons per minute when operating at a filtration rate not to exceed 519.4 gpm per square foot of filter area. Filter requirements shall meet and exceed the filtration rate stated above. All other filters which have a higher application rate than 1.2 gpm per square foot shall be rejected.
2. The filter shall include the media.
3. System shall be fabricated and fully assembled at the manufacturer's plant for pressure testing and dimensional verification. System shall be knocked down for shipping purposes in subassemblies for minimum field assembly. Internal manifold and lateral piping shall be factory installed and shipped in place.

C. Filter Tank

1. The filter tank shall be suitable for 50 psi working pressure and hydrostatically tested to 75 psi. Tank shell shall be not less than ¼-inch thick. Bottom dished head shall be not less than ¼-inch thick. Top flat head shall be not less than 1-1/2 -inches thick. All material shall be Type A-36 carbon steel.
2. All welding shall be performed by qualified operators. Joints shall be butt or fillet welded inside and out by manual or automatic process. Welded joints shall have complete penetration and fusion with little or no reduction of the thickness of the base metal. Welds shall be free of coarse ripples, grooves, overlaps, abrupt ridges or valleys. All welded surfaces shall be chipped and brushed clean, when necessary, leaving no slag or splatter.
3. Tank legs shall be constructed of 6-inch x 2- ½-inch channel legs ¼-inch thick. 24-inch, 27-inch and 33-inch filters shall have (3) legs. 41-inch, 49-inch and 55-inch filters shall have (4) legs. The material shall be Type A-36 carbon steel. Bearing plates shall be 10-inches x 5-inches x ½-inch type 304L stainless steel. Each bearing plate shall have (2) 5/8-inch drilled holes to secure to the floor with ½-inch x 4½-inch stainless steel concrete anchors provided. The legs shall be designed with bolted connections to minimize overall tank height for shipping and access into the mechanical room.
4. The tank head shall be bolted to the shell with 7/8-inch diameter T304 stainless steel bolts, nuts and washers, 9-inches on center around the tank perimeter.
5. Tank shall be equipped with a UL listed grounding lug.
6. Tank shall incorporate connections for filter influent, effluent, drain; 1 ½-inch diameter vacuum transfer piping, Tank shall include a 12-inch diameter access port with cover, 6-inch viewing window, hardware to facilitate cleaning of tube elements and interior inspection of filter and lift shaft gland.
7. Tank shall include brackets for mounting of RMF System controller, gauge panel, filter/regulator, vacuum transfer blower, and vacuum hose rack.
8. Tank shall include an integrally mounted hydraulic lifting device (davit). The davit assembly shall be designed to lift the filter head and include a pivot mechanism allowing the head to rotate 180°, for access to the tube sheet.
9. NOTE: Systems requiring additional devices for filter head removal will not be considered.

D. Interior Lining (For Filter)

1. All interior surfaces shall be grit blasted to white metal condition with a 3-4 mil profile. Blasted surfaces shall be cleaned of all dust or blast residues. Lining shall be applied as soon as is practical on the same day blasting is done.
2. Lining shall be a urethane, 100% solid plural component lining. Hardness shall be 75 durometer on the shore D scale. Break tensile strength shall be 4000 psi with elongation of less than 10%. Adhesion shall be greater than 2500 psi.

3. Application of Flexsol 3000® lining shall be done by experienced applicators using a high pressure, high temperature plural component system. All wetted surfaces including flange faces, manway rings and manway covers shall be lined to 100 mils +/- 10 mils WFT.
 4. Hardness shall be verified after curing to ASTM D 2240 standard.
 5. Manufacturer shall submit for approval a sample piece of coated steel to determine flexibility, abrasion tolerance and adhesion integrity.
 6. Flexsol 3000® lining shall meet the NSF toxicity standard unconditionally and shall be approved for use with the NSF approved filter.
- E. Exterior Coatings (For Filter)
1. All exterior surfaces shall be grit blasted to white metal condition with a 2-3 mil profile. Blasted surfaces shall be cleaned of all dust or blast residues and primed as soon as is practical on the same day blasting is done.
 2. When priming has dried the coating process will begin. If primer has sat for over twenty-four hours, a refresher coat will be applied.
 3. Two coats of high solids enamel shall be applied for a total developed film thickness of 5-8 mils.
 4. Manufacturer is to supply min. 16 oz. of high solids enamel touch-up paint.
- F. Internal Components
1. The filter shall consist of flex tube elements, filter tube sheet, stainless steel lift shaft and internal flow diversion assembly.
 2. The filter elements shall be flexible tubes that provide the support structure for the media. The outer wall of each element shall be fabricated of multi-filament high strength polyester braid. Each element shall have an internal Type T316 stainless steel spring, which acts as a support structure for the braided filament.
 3. The filter element tube sheet shall be fabricated of Type T316 stainless steel and provide both support for the top of the element assembly as well as watertight seal to prevent media from escaping the filter tank.
 4. The lift shaft shall be fabricated from Type T316 stainless steel and provide the internal connection between the filter element tube sheet and the external bump mechanism.
 5. The filter influent connection shall be fitted with a Type T316 stainless steel flow diversion assembly to eliminate disturbance to the filter elements during operation.
 6. All stainless-steel wetted fasteners shall be Type T316.
 - a. NOTE: Systems utilizing rigid elements with replaceable filter septum shall not be considered.
- G. Pressure Gauges
1. Provide pressure gauge for pump discharge mounted on panel attached to filter tank. Gauge(s) shall be at least 2 ½-inches in diameter, calibrated in psi for 0 to 60. Provide gauge cock and pressure tubing. Provide pressure gauge installed at pump discharge with rubber fitting.
- H. Vacuum Gauges
1. Provide compound gauge for pump suction port. Gauge(s) shall be at least 2 ½-inches] in diameter. Gauge shall be calibrated to 30-inches hg vacuum and 0 to 60 psi.
- I. Make-up Water Level System
1. Pool water level shall be maintained by an automatic water make up system operated by the Chemical Controller.
 2. System shall consist of a water level probe, found in the collector tank.
 3. Water level shall be controlled using a three-probe electrode system, two for high and low level and one ground. Electrodes shall be T316 stainless steel connected to a UL approved probe holder. A mechanical linkage or float operated system will not be acceptable. Float shall be installed in the level vial on the collector tank.
 4. Probe shall include water level control transducer or approved equal.

J. Flowmeters

1. Flowmeter shall be installed on the filtered water return line to the pool and the UV line. Flowmeter shall be complete with flow sensor and shall be digital with electronic read out to connect to chemical controller and UV panel.
2. Flowmeter shall be installed on heater line and dehumidification system booster line. Flowmeter shall be as indicated on Contract Documents, or approved equal.

K. Pumps and Motors:

1. Pumps used for the Pool shall be the following, or approved equal:
 - a. Filter Pump: existing 15 HP pump. Pump shall be designed for 620 GPM, at 74 TDH. Pump shall have a 3 phase, 480 volt motor.
 - b. Drain Down Pump: Model No. Whisperflo 015583, manufactured by Pentair, 1.1 HP pump. Pump shall be designed for 40 GPM, at 58 TDH. Pump shall have a 3 phase, 208 volt motor.
 - c. Filter Pump Strainer: A strainer shall be installed on the influent side of the pump(s) suction. Strainer shall be 8x8 strainer, with one extra basket.
 - d. Filter Pump Anti-Vortex Plate: An anti-vortex plate shall be installed in the collector tank on the side of the pump suction. Anti-Vortex plate shall be PVC with stainless steel hardware.
2. Motors:
 - a. Totally enclosed, fan-cooled (TEFC), with hygroscopic insulation, service factor 1.15, insulation Class F, sized to operate at full load and speed, designed for continuous operation.
 - b. Motor starter with current interrupter overload.
 - c. Combination motor starters: Hand-off auto switch and positive overload heater coil; as manufactured by Furnas, Square D, or Westinghouse.
 - d. Electrical enclosures: NEMA 4x type, suitable for surface mounting.
3. Filter pump shall be vibration isolated. The pump shall be mounted on ¼-inch neoprene pads placed between the pump base and pump pedestal. Neoprene pads shall be equivalent to the Mason Industries Type Super W Pads. The pads shall be sized to provide minimum 0.15-inch static deflection under the weight of the pump.
4. All pumps shall be electrically interlocked with the chemical controller and system flow meter.

L. Chemical Treatment Equipment

1. Automatic Analyzer and Chemical Feed Controller: Furnish and install a fully integrated pool water chemical analyzer and feed controller. The chemical feed controller shall be equipped with options of filter pump control, flow monitoring, Ethernet/internet, remote control, water level control, chemical control, and temperature control.
 - a. The chemical controller shall be connected to a dedicated Ethernet cord. The Contractor shall furnish and install all necessary software required to run a monitoring system remotely.
2. Chemical Feeders
 - a. Metering pump: The chlorine feed pump shall be N.S.F. listed.

M. pH Feed Systems

1. Unit shall be a single tank regulator and automatic dual tank switch over CO₂ metering system and take nominal 800-psi pressure from direct reading pressure gauges. Unit shall be tank mountable and shall connect to CO₂ cylinder(s) by 3/16-inch I.D. braided tubing rated for not less than 1000 psi. Discharge from unit shall be through thick wall 3/8-inch OD polyethylene tubing to the feed unit.
2. CO₂ from the pressure-reducing valve shall be brought to the feed unit in thick wall 3/8-inch OD polyethylene tubing. Feed system shall include 120volt AC solenoid operated valve for remote on/off control of CO₂ feed. CO₂ feed unit shall also include rate adjusting flow meter scaled from 20-200 SCFH and have a pressure rating of 100 psi.
3. CO₂ from feed unit shall be injected through ½-inch NPT fitting. Unit shall cause CO₂ to be totally diffused and made to go fully into solution without evidence of CO₂ bubbling at any point where

water is open to atmosphere. Unit must be equipped with a check valve to prevent the flow of water into the feed unit.

4. CO2 bulk storage tank shall be 450 lbs. with a pressure regulator and epoxy coating.
5. CO2 tank shall be provided with an exterior fill station with an enclosure. The fill station shall be supplied in conjunction with the tank system.

N. Test Kit

1. Provide test kit, as indicated on Contract Documents or approved equal, for measuring FAC chlorine residuals and pH. Include sufficient reagents for one year of testing. Furnish in carrying case with separate slides for pH and chlorine.

O. Eye Wash Station

1. Re-install existing eyewash station.
2. Eyewash shall be wall mounted in the filter room.

2.2 PIPING:

A. Valves and Piping

1. Piping: All materials and equipment shall be new, of best quality for the purpose intended, and shall be clearly marked with the manufacturer's name and nameplate, date, or stamp and rating. As far as practicable, materials and equipment shall be one manufacturer.
2. Polyvinyl Chloride Pipe and Fittings:
 - a. Provide Class 12454 B polyvinyl chloride pipe for all pipes used for distributing chemical solutions. All pipes shall be Schedule 80.
 - b. Provide solvent weld type fittings for all chemical solutions distribution systems except for the lime solution system. A heavy-duty industrial grade PVC solvent cement shall be used.
 - c. CPVC Schedule 80: Type 1, normal impact, NSF approved for solvent welding applications, for exposed piping. CPVC piping shall be used for the heating loop from the supply filtered effluent line to the heat exchanger and the heated effluent return from the heat exchanger back to the filtered effluent line.
3. Flexible connectors:
 - a. All connections between the chemical proportional feed pumps and the rigid PVC pipe shall be of flexible plastic hose.
 - b. The hose shall consist of polyester braided reinforced tubing with a minimum rating of 150 psi.
 - c. All materials, hardware components, and accessories shall be corrosion resistant. They shall be 316 stainless steel, fiberglass, high density resin, or PVC.
4. Cement: ASTM D2564.
5. Provide check and ball valves by Hayward as required.
 - a. Gate valves three inch (3-inch) and larger shall be PVC stainless steel mounted non-rising stem. Valves shall have flanged ends and shall be designed for a minimum water working pressure of 150 lbs. per square inch.
 - b. Butterfly Valves: Butterfly valves shall be EPDM seated with PVC disc and stainless-steel shaft for chlorinated pool water service. Furnish hand wheel/gear operators on all valves 8-inch and larger and valves indicated as throttle valve service.
 - c. Check Valves: Provide a corrosion resistant body, EPDM seated wafer type valve with bronze plates and shaft.
 - d. All valves 3-inch and larger shall be ASAHI EPDM butterfly valves or Hayward industrial PVC valves or approved equal.
 - e. All valves 3-inch and smaller shall be Spears True Union or approved equal.
6. Valve connections: Suitable for connection of adjoining pipe; of pipe size values.
7. All hardware shall be stainless steel.
8. Cement: ASTM D2564.
9. Valve connections: Suitable for connection of adjoining pipe; of pipe size values.

10. Hangers and supports: Sized to project conditions. Shall be stainless steel, or FRP, installed with stainless steel hardware.
11. All pipes shall be vibration isolated with a ½-inch thick neoprene pad between the strap and the pipe.
12. All valves shall be tagged and numbered with a 2-inch polyethylene identification tag coordinated into the O&M at the conclusion of the project.
13. All piping shall be identified with pipe labeling. Piping shall be marking indicating the direction of flow, and what vessel the filtered water is coming from. Labels shall be polyethylene pipe identification, shall be snap on and secured to the associated piping. Pipe labels shall be manufactured by Seton or approved equal. Stickers or permanent marker shall be rejected.

2.3 HEAT EXCHANGER:

- A. The pool heat exchanger shall be as indicated on Contract Documents or approved equal.

2.4 VARIABLE FREQUENCY DRIVES (VFDS):

- A. VFD will be installed with the pump(s) installed in this project. Each VFD shall match the horsepower of the pump motor, voltage, and phase. The pump shall have factory installed disconnects and bypass variable frequency drive for motor protection and thermal overload protection, voltage and surge limitation, integrated hand / off / auto switch with manual bypass.
 1. VFD shall have a factory installed digital display screen. Display screen shall display the motor operating parameters (HZ, Volts, and amps).
 2. VFD enclosure shall be a NEMA 4x enclosure, frame size A5.
 3. VFD shall be wall mounted with enclosure (typical).
 4. VFD shall be interlocked with regenerative filter control panel.

2.5 CONTROL AND POWER WIRING:

- A. Control wiring shall be a minimum of #10 wire, or per manufacturer's requirements.
- B. Control wiring shall be placed in a ¾-inch PVC conduit.

PART 3 - Execution

3.1 INSTALLATION:

- A. Install equipment and system in accordance with manufacturer's instructions and approved shop drawings.
- B. Set equipment on secure foundations.
- C. Make piping joints in accordance with ASTM D2855.
- D. Support overhead piping and at connections to valves, pumps, and equipment.
- E. Install electrical components in accordance with NFPA 70.

3.2 FIELD QUALITY CONTROL:

- A. Water Treatment:
 - 1. Submit chemical analysis of source water supply showing:
 - a. Total alkalinity in PPM.
 - b. Calcium hardness in PPM.
 - c. Chlorine in PPM.
 - d. pH.
 - e. Iron and Phosphorus.
 - 2. Treat and balance pool water just prior to Substantial Completion.
 - a. Establish total alkalinity of 80 to 150 PPM and calcium hardness of 175 to 250 PPM.
 - b. Balance pool water to local health code requirements.
 - c. Contractor shall furnish all balancing chemical and labor to balance and maintain the pool(s) and spray deck prior to acceptance by the Board of Health.

3.3 ADJUSTING:

- A. Adjust pool system for proper operation through all cycles.

3.4 CLEANING:

- A. Clean equipment, and related surfaces.

3.5 DEMONSTRATION:

- A. Demonstrate proper operation and maintenance of pool systems to Owner.

3.6 TESTING:

- A. Test pool piping to 35-psi hydrostatic pressure for pressure piping and 10-psi for gravity piping, for a duration of 2 hours. The test shall be witnessed by the Owner, or Owner's Representative. If the test fails, the repair must be performed, and a new test shall be performed. Pressure shall be maintained on the piping until the system is commissioned.

3.7 PROTECTION, MANUALS, AND INSTRUCTIONS:

- A. Protection: The Pool Contractor shall use whatever methods are required to protect pool equipment from deterioration during remainder of the construction period.
- B. Manuals and Instructions: Start up, test, and operate the completed system to verify its performance in compliance with Contract Documents, and to meet approval of governing authorities. Coordinate pool-filling schedule with work of other Sections and, after finish work is cured, circulate, and treat water until Owner accepts installation.
 - 1. Provide complete operating and maintenance manuals for pool and equipment. Provide four (4) sets.
 - 2. After approval of submission of manuals, instruct Owner's personnel in the operation, use and maintenance of the entire installation and each operating element, for a total of 16 hours with selected manufacturers' training representatives. Final acceptance will not be made until training is complete to Owner's satisfaction.

3. Provide Warning Rules and Regulations sign as required by Federal, State, OSHA, and Local code, and Health Codes.
4. Provide four (4) packages of items above.
5. Contractor shall, operate the system until acceptance and approval by health department.

END OF SECTION 13 11 00.16

SECTION 13 11 00.19 - ULTRAVIOLET SYSTEM FOR SWIMMING POOL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. It is the intent of these specifications that the swimming pool water be routinely monitored and treated by ultraviolet (UV) sterilization in the wavelength range of 220nm to 400nm to kill bacteria, viruses, molds and their spores, and to continuously remove chloramines. The concentration of free chlorine residual shall at all times meet the requirements of the authority having jurisdiction over the swimming pool operation.
- B. The method of monitoring and treatment specified and shown on the drawings is intended as the basis for receiving bids. It is not the intent of these specifications to limit competition. The base proposal must be on furnishing equipment as specified; however, a bidder may at his option offer a substitution. The bidder is cautioned that any substitution must meet the quality and operational requirements of these specifications. Any proposed UV system must have a UL listing on the complete system and be listed under NSF Standard 50 latest edition including cryptosporidium inactivation. Any substitute system shall have Department of Health approval for this project prior to being offered.
- C. The UV system offered under these specifications shall have been used for a minimum of ten years in swimming pool applications and the bidder must supply a list of at least ten satisfactory installations with contact names and telephone numbers.

1.2 RELATED WORK

- A. Section 13 11 00 - Summary of Work for Swimming Pool
- B. Section 13 11 00.16 - Equipment for Swimming Pool
- C. Division 26 - Electrical

1.3 QUALITY ASSURANCE

- A. All equipment supplied under this section shall conform to ANSI/AWWA F110-12, AWWA Standard for Ultraviolet Disinfection Systems for Drinking Water.
- B. All material specified under this section shall be provided from the same manufacturer.

1.4 SUBMITTALS

- A. Electronic submission for manufacturer's literature of the materials of this Section shall be submitted to the Engineer and General Contractor for review.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Each container shall bear an unbroken seal, test number, and label of the manufacturer upon delivery at the site. Unlabeled materials will be rejected and shall be removed from the site and replaced with approved-labeled materials at no additional cost to the Owner.
- B. Deliver materials to site and provide work under this Section in ample time to avoid delay in job progress and at such times as to permit proper coordination of the various parts.
- C. Store UV system under tarps to protect from oil, dirt, and sunlight.

1.6 GUARANTEES

- A. The equipment shall be warranted in writing that when operated and maintained according to the manufacturer's operating instructions provided and accepted, it will perform in complete accordance with these specifications. All components (excluding the UV arc tube) shall have a limited warranty to be free from defects in workmanship and materials for a period of 12 months from date of Substantial Completion. UV arc tubes shall be warranted to operate for 8,000 hours when operated continuously. A continuously operated UV arc tube that fails prior to 8,000 hours of operation shall be replaced free of charge. Intermittently operated UV arc tubes (>1 on/off cycle per day) will be replaced free of charge should failure occur prior to 2,000 hours and prorated between 2,000 and 4,000 hours. All warranty replacements shall be FOB point of shipment.
- B. Any claims under this warranty must be made on a timely basis, in writing, to the manufacturer.

PART 2 - PRODUCTS

2.1 DESIGN CONDITIONS

- A. The UV system shall be provided for the following design and operating conditions:
 - 1. Swimming Pool: 620 GPM, 3-Phase, 460-volt power. Buck booster required if 460 is not available. NEMA 12 Cabinet.
- B. Design UV Dose
 - 1. The system shall be designed to deliver a Reduction Equivalent Dose (RED) of 600 J/m² based on the end of lamp lifetime (70% of specified new lamp output according to NSF).
 - 2. Head loss through the UV system shall not exceed 2 psi under design flow conditions.
 - 3. Power consumption of the Pool UV system shall not exceed 3 kW. Systems not meeting this requirement shall not be acceptable.
 - 4. System shall comprise one (1) duty reactor.

2.2 UV SYSTEM GENERAL

- A. UV systems shall be re-installation of the existing Triogen 145 system.
- B. The UV disinfection system shall be installed by the Contractor and tested and commissioned by the UV manufacturer or its authorized representative as specified in this section.

2.3 REACTION CHAMBER

- A. The UV reactor shall be a welded construction, manufactured from 316L stainless steel of a thickness of no less than 2 millimeters. The UV reactor shall be passivated.
- B. The UV reactor shall be designed to handle a maximum operating pressure of 150 psi and shall be fully assembled then hydrotested to 1.5 times the design pressure in the factory prior to shipment.
- C. The UV reactor shall have end-cap safety switches that automatically switch off the UV lamps to prevent exposure to UV radiation should the endcaps be removed.
- D. The UV reactor shall be provided with two (2) cleaning ports.
- E. The UV reactor shall be designed such that the operating personnel can change the lamps without draining the reactor.
- F. The UV reactor shall have a temperature sensor to prevent over-temperature events.
- G. The system must incorporate a mechanical switch in which to disable power to the lamps should the chamber be opened while in use. Systems not incorporating such device will not be accepted. For safety purposes for operating personnel, if upon field inspection the referenced switch is not present one shall be installed and supplied at the Contractor's expense. If the system is not capable of accepting such a safety device the system shall be replaced at no additional cost to the Owner.

2.4 UV LAMPS

- A. Lamps shall be medium-pressure mercury UV lamps. The medium-pressure mercury UV lamps must be provided with ceramic lamp ending for cooling and proper lamp positioning inside the quartz sleeve.
- B. The emission of the medium-pressure UV lamps into the water must have a wide range of wavelengths in the range of 200 to 400 nm.
- C. Each lamp will be capable of producing a minimum output of effective UV energy in the wavelength range of 200 to 400 nm following a 100-hour burn-in period. Low-pressure, low-output and low-pressure, high-output UV lamps shall not be permitted due to the increase in quantity of lamps required.
- D. The filament shall be significantly rugged to withstand shock and vibration.
- E. The lamp bases shall be resistant to UV and ozone.
- F. The UV lamps shall be guaranteed for 8,000 hours of operation, prorated after 1,000 hours.
- G. The lamp output shall not fluctuate at all due to water temperature variations.
- H. Lamps must be powered by chokes. Electronic ballasts are not acceptable since they limit the distance between the chamber and the power supply to 13 feet to operate effectively and must be replaced every two to three years.

2.5 QUARTZ SLEEVES

- A. Each UV lamp assembly shall consist of a UV lamp enclosed in an individual quartz sleeve, with both ends appropriately sealed using an O-ring with sealing screw.

- B. The UV lamp sleeve shall be a single piece of clear fused quartz circular tubing open at both ends.
- C. The quartz sleeve shall be rated for an initial minimum UV transmittance (254 nm, 1 mm) of 86%.
- D. The electrical connections to the lamp assembly shall be made at both sides of the lamps with a single wire connection in an easy to operate plug-in terminal.
- E. The lamp assembly shall allow all the following to be easily achieved by an operator for maintenance purposes:
 1. Access to the lamp connections without removing or disconnecting any cables and without the use of special tools.
 2. Disconnection of lamp power cable only, without removing the UV lamp or the lamp assembly from the reactor.
 3. Easy lamp positioning due combined cooling and centering ceramics on the lamp.

2.6 UV INTENSITY SENSOR

- A. The UV intensity sensor shall be selective only to the electromagnetic spectrum specific to UV light (200-400 nm). UV light outside the 200-400 nm range shall not be measured. The sensor shall be designed with an accuracy of +/- 5%.
- B. The measured intensity shall be displayed on the operator interface (HPC-II) as an absolute value in W/m².
- C. The UV intensity sensor connection must be realized with a two (2) wire 4 - 20 mA connection with watertight connector on top of the sensor housing.
- D. The UV sensor must be absolute calibrated by the manufacturer. UV sensors or sensor signal display modules that require recalibration after installation are not acceptable. UV sensors of which the output signal or display system UV intensity can be "field calibrated" are not acceptable. The UV intensity display must be able to provide a read-out in absolute units being W/m².

2.7 UV STRAINER

- A. The UV system must be provided with a downstream strainer to protect against the remote possibility of lamp and quartz breakage traveling downstream.
- B. The strainer must be operable either manually, electrically or pneumatically to clean it.
- C. The electrical or pneumatic operation must be able to be integrated with the filtration control system and/or the UV control system.

2.8 CONTROL PANEL

- A. The control panel shall house all power distribution and control hardware.
- B. The control panel shall be designed to operate with power feed as required.
- C. The control panel enclosure shall be epoxy coated sheet steel rated NEMA 12 for indoor installation.
- D. The control panel enclosure shall be located in an ambient temperature-controlled environment where the maximum temperature does not exceed 104 deg. F.

- E. The control panel must be cooled by an independent forced-ventilation system and the air inlet and outlet openings must be protected by dust filters.
- F. The temperature inside the control panel must be monitored by a built-in temperature sensitive device.
- G. The cable length distance between the control panel and the UV reaction chamber shall be 33 feet.
- H. The control panel must include a GFCI device with a sensitivity of 30 mA for personal and system protection.
- I. Local over-current protection shall be provided by the Contractor.

2.9 CONTROL AND INSTRUMENTATION

- A. Lamp Power Control and UV Intensity Pacing shall be included as standard.
- B. The UV intensity shall be continuously monitored. As the intensity varies with lamp age, water quality or fouling of the quartz sleeve, the lamp power shall be automatically adjusted to maintain sufficient, microbiologically safe operation in the most economical way.
- C. All control hardware and software shall be contained within the control panel.
- D. The unit shall be furnished with two temperature high limit switches. One shall monitor water temperature inside the reactor with visual alarm on high limit temperature. The second shall monitor the reactor chamber wall temperature and shall shut off the unit should temperature exceed high limit settings by manufacturer.
- E. The UV system shall be monitored and controlled by UV controller included with the system.

2.10 OPERATOR INTERFACE

- A. The operator interface unit shall be integral with the controller.
- B. The unit shall be menu driven and shall display the following system information when prompted:
 1. UV lamp operating hours per power level and per lamp (if more than one (1) lamp is used)
 2. UV intensity in W/m² or %
 3. Flow rate in GPM (measured by an external online flowmeter provided by others)
 4. UV lamp ON/OFF switching
 5. Water temperature in deg. F
 6. Average Calculated Dose in mJ/cm²

2.11 CLEANING SYSTEM

- A. Each UV system must have an automatically operated mechanical cleaning system for the quartz sleeve(s).
- B. The automatically operated cleaning mechanism must have one (1) special UV resistant Viton rubber cleaning ring mounted in a Teflon cleaning ring holder per quartz sleeve. The cleaning ring holder must be mounted in a stainless steel plate which is connected to the rod or axis that operates the cleaning action. Only one (1) cleaning ring per quartz sleeve may be used; systems with more cleaning rings per quartz sleeve will have a disturbed hydraulic pattern inside the reaction chamber and shall not be accepted.

- C. The automatic cleaning system shall monitor wiper position by measuring revolutions of the wiper shaft position. Systems utilizing limit switches shall not be acceptable.
- D. Each UV reaction chamber shall be provided with the necessary connections to connect a chemical cleaning system. Systems that do not include chemical cleaning connections on the treatment chamber shall not be acceptable.
- E. During the duration of a cleaning action no UV alarm or warning signal shall be activated if the cleaning mechanism passed the UV sensor position. Chemical cleaning must be done when the system is passed to prevent the chemicals from entering the pool/spa.

2.12 SPARE PARTS

- A. The following spare parts and safety equipment shall be supplied, per unit:
 - 1. One (1) complete set of replacement lamps
 - 2. One (1) Quartz sleeve including O-rings.
 - 3. One (1) complete set of replacement Viton wiper rings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation of the equipment shall be in accordance with the contract drawings, manufacturer's engineering drawings, and instructions.

3.2 SUPPLIER'S SERVICES

- A. Field services by the UV manufacturer or its authorized representative shall consist of the following:
 - 1. Installation supervision: One (1) full day (8 hours) on site (1 trip).
 - 2. Start-up, field testing and operator training: One (1) full day (8 hours) on site (1 trip).

END OF SECTION 13 11 00.19

SECTION 13 11 43 – PERIMETER OVERFLOW RECIRCULATION SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. Perimeter Recirculation System

1. Manufacturer shall furnish and install a perimeter recirculation system for the swimming pool as shown on the project drawings and specified herein.
2. The gutter shall be a prefabricated stainless steel gutter system.
3. Lane anchors and vinyl depth markers for gutter system.
4. Welding of competitive pool equipment anchors to gutter.

B. Basic Performance Requirements

1. The gutter system shall provide uninterrupted skimming action, at the handhold, around the perimeter of the entire system in accordance with the intent of state and local Department of Health codes. Installation tolerance of the handhold, around the entire perimeter, shall be $\pm 1/16$ -inch.
2. The gutter system shall have the capacity to convey 100% of the recirculation rate of the pool in question without flooding. Flooding shall be defined as the water level in the overflow channel occupying the same elevation as the channel grating at any point in the system's perimeter.
3. The perimeter recirculation system shall be capable of maintaining channel flow and surface skimming under all conditions of normal operation without any water discharged to waste except when cleaning the filters or emptying the pool.

C. Configuration Selections:

1. Roll-out

1.2 RELATED WORK:

A. The following sections contain work that relates to this Section:

1. Section 01 33 23, SUBMITTALS
2. Section 01 92 13, OPERATION & MAINTENANCE MANUALS
3. Section 03 11 00, CONCRETE FORMWORK FOR SWIMMING POOL
4. Section 03 37 13, SHOTCRETE FOR SWIMMING POOL
5. Section 07 92 00, WATERSTOPS AND SEALANTS FOR SWIMMING POOLS
6. Section 13 11 00, SUMMARY OF WORK FOR SWIMMING POOLS

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications

1. Only manufacturers with a minimum five years experience in the design, manufacture, and field installation techniques required for stainless steel gutters are acceptable.
2. To assure singular responsibility by the manufacturer for installation, performance and warranty, the system shall be installed by the manufacturer or a designated licensee.

1.4 REFERENCES:

- A. ANSI/APSP-7 2006, American National Standard, For Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs, and Catch Basins.

- B. ANSI/ASME A112.19.8 1987 (reaffirmed 1996), Suction fittings for swimming and wading pools, spas, hot tubs and whirlpool bathtub appliances.
 - C. ANSI/ASME A112.19.17-2002, manufactured safety release systems (SVRS) for residential and commercial swimming pool, spa, hot tub and wading pool suction systems.
 - D. ASTM F 2387-04, Standard specification for manufactured safety vacuum release systems, swimming pools, spas and hot tubs.
 - E. IAPMO SPS-4 2000, Special use suction fittings for swimming pools, spas and hot tubs (for suction side automatic swimming pool cleaners).
 - F. NFPA 70 – 2005, National Electrical Code, Article 680, Swimming pools, fountains, and similar installations. (See also specification Division 16 and Electrical design provided by others.)
 - G. FINA – Federation Internationale de Natation Amateur
 - H. USS – United States Swimming Incorporated
- 1.5 SUBMITTALS, IN ACCORDANCE WITH SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING
- A. Submittal Drawings
 - 1. Submit shop drawings showing locations of each item, dimensioned plans and elevations, dimensioned gutter profile drawings of both end and sidewall gutter sections, and large scale details clearly indicating attachment devices, and materials as well as finishes. Details must also show work in relation to all adjacent trades.
 - B. Calculations
 - 1. The manufacturer shall provide complete, detailed calculations indicating the ability of the recirculation system to handle design flows equal to both project specified flows as well as any State and Local Health Code Regulations.
- 1.6 DELIVERY, STORAGE AND HANDLING:
- A. Prefabricated stainless steel sections to be shipped on pallets, suitably wrapped and secured. All system containers and pallets shall be legibly marked. The Engineer may reserve the right to require proof of material type supplied.
 - B. The prefabricated Gutter System is shipped in partially finished form. Contractor shall protect the system from damage caused by work of other trades, weather, ground conditions or vandalism before, during and following installation.
- 1.7 GUARANTEES:
- A. The Manufacturer of the gutter system shall provide the Owner with a separate written (minimum) 3-year warranty against defective materials or workmanship. Manufacturer/Installer must also provide a separate, written 3-year warranty on the trench’s grill covers protecting the Owner against defective materials or workmanship. (In the event of grill cover defect, Manufacturer will replace any portion of it at no cost to the Owner.)
 - B. The Manufacturer shall provide its limited non-prorated five-year warranty. The warranty shall cover that the system is free of all defects due to poor workmanship and materials for a period of (5) five years from the date of Substantial Completion. Furthermore, if the system is operated in accordance with written instructions given and accepted by the Owner, it will perform in complete accord with the specifications.
 - C. The warranty shall not include damage caused by abusive treatment to the system either during the construction phase of the project or when the system is operational.

PART 2 - PRODUCTS

2.1 Design & Materials of Construction:

- A. Perimeter sections shall be fabricated entirely from Type 316L stainless steel with a finish similar or equal to a #4 polished finish. 1 1/2" X 1 1/2" X 3/16" angle anchors and all stiffener brackets shall be stainless steel.
- B. All exposed horizontal surfaces shall be sand blasted to provide a skid resistant finish.
- C. Filter Water Supply Channel
 - 1. Filtered water return tube shall be fitted with appropriately sized nylon jet inlet nozzles placed in a continuous "V" notch formed into perimeter overflow system.
 - 2. Inlet jets shall be installed so as to provide a stream of filtered chlorinated water on a fixed 45° angle directed toward bottom of pool.
 - 3. Filtered water supply conduit shall be factory welded using Pulse TIG and Pulse MIG process by manufacturer in their plant and pressure tested prior to shipment. Field welded pressure conduits shall not be acceptable.
 - 4. Velocity in the return tube shall be less than the velocity specified by state and local health codes in regard to pressure lines.
- D. Overflow Channel
 - 1. Main overflow channel shall be fitted with jet flow nozzles, as shown on plans, to provide a constant stream of filtered chlorinated water in channel to prevent any stagnation or build-up of dirt. All areas of gutter shall be accessible for inspection and cleaning.
- E. Grating
 - 1. Perimeter systems to be covered by a protective grating machined from UV resistant High-Density Polyethylene (HDPE) top grating for maximum efficiency in quelling waves.
 - 2. Top grating shall meet and/or exceed ASTM D2047 Slip Resistance (Wet) with a nominal value of 0.62 to create a non-skid surface.
 - 3. Open area of grating shall not be less than 30%.
- F. Anchorage
 - 1. Entire perimeter overflow system section shall be anchored to pool structure with commercial quality threaded stainless-steel rods (or #5 U-bars, if shown on the drawings) as shown on plans. These anchors shall be placed one-foot from corners and on a maximum of four-foot centers around pool.
 - 2. Stainless steel deck equipment anchors shall be attached to stainless steel gutter with stainless steel angle brackets.
 - 3. Ground the entire system per N.E.C./State Codes/Local Codes.
- G. Converters
 - 1. The appropriate number of drain converters shall be provided such that the velocity in the pipe of each converter shall not exceed that which is specified by state or local health codes in regards to gravity lines unless the converter is under direct pump suction in which case the code velocity for suction lines shall govern.
 - 2. The appropriate number of supply converters shall be provided such that the velocity in the pipe of each converter shall not exceed that which is specified by state or local health codes in regard to pressure lines. Converters requiring concrete encasement shall not be acceptable.
 - 3. All converters shall be fabricated of 12 gauge type 316L stainless steel with schedule 10 pipes and a minimum of 3/8-inch thick stainless steel flanges. Said flanges shall incorporate an ANSI 16.5 B bolt pattern.

2.2 ADDITIONAL EQUIPMENT:

A. Depth Markers

1. Vinyl depth markers shall be furnished, in accordance with all state and local health codes regarding nomenclature, spacing, and minimum height requirements, by the gutter manufacturer.
2. The depth markers shall be of a flat black finish and shall be field installed by means of self-adhesive backing against a stainless backsplash.

B. Racing/Safety Line Cup Anchors

1. Install recessed cup anchors, in the 4-inch strip of exposed stainless below the handgrip in the locations detailed on the drawings. The anchors shall be comprised of a 304 stainless link and retaining pin all captured within a Vaylox 351 custom molded cup. Said assembly shall be held in place by means of the pin against the back of stainless face and will thereby be tamper resistant. Anchors that can be easily removed when no tension exists in the lane/safety line shall not be acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Contractor must provide written confirmation and identification of site-specific benchmark prior to commencing gutter installation.

B. Welds

1. Only welders authorized by the Gutter System Manufacturer shall mount the perimeter overflow system on the pre-embedded anchorage installed by "others".
2. Gutter system sections shall be leveled to a tolerance of $\pm 1/16$ -inch and subsequently welded into one continuous length around the entire swimming pool perimeter in question.
3. Welding shall be of TIG process and shall be cleaned and blended when still hot to present a flush, smooth finish.

C. Testing

1. After the gutter sections are together the return tube and inlets shall be installed and then hydrostatically tested for leaks at a pressure of 7-10 PSIG for two hours.

D. Sign-Off

1. Immediately following completion of the installation, the installer shall obtain written certification from the Contractor that the installation is acceptable, complete, tested, and that the gutter overflow rim is level to a tolerance of $\pm 1/16$ -inch around the entire pool perimeter in question.

E. Grout Space

1. After installation is complete, the Contractor shall apply a non-shrink grout in the amount of a minimum 3-inches under the gutter and 5-inches behind. Grout installation shall not occur in lifts greater than 12-inches to prevent buckling of the overflow channel and shall be properly vibrated to eliminate voids.

F. Sealant Joints

1. After the installation of the grout is finished the Contractor shall provide a sealant joint at the interface of the exposed gutter face and the pool finish as well as at the interface of the backsplash and pool deck.

G. Cleaning

1. After all construction in the area of the gutter is complete, and before the pool is filled, the gutter shall be given a final cleaning with the manufacturer provided cleaning supplies.

END OF SECTION 13 11 43

SECTION 13 11 46 - DECK EQUIPMENT AND ACCESSORIES FOR SWIMMING POOL

PART 1 - GENERAL

1.1 WORK INCLUDED:

- A. Furnish and install pool grab rails, ladders and/or step inserts, competition equipment, ADA accessible equipment, rescue and safety equipment, and maintenance equipment as specified herein and required by the State of New York Department of Health.
- B. Furnish deck equipment anchors and escutcheons.
- C. Inspect and approve placement and grounding of anchors before embedment by concrete.
- D. Provide signage as requested by the New York State Approving Authority.
- E. Furnish and install 1-meter and/or 3-meter diving boards, stands, and rail systems.
- F. Furnish and install starting platforms and other racing equipment as indicated on the plans.

1.2 RELATED WORK:

- A. Section 13 11 00, SUMMARY OF WORK FOR SWIMMING POOLS
- B. Section 13 11 00.16, SWIMMING POOL EQUIPMENT
- C. DIVISION 26 – ELECTRICAL

1.3 DELIVERY, STORAGE AND HANDLING:

- A. Swimming Pool Contractor shall protect the deck equipment from damage caused by work of other trades, weather, ground conditions, or vandalism before, during, and following installation.

1.4 GUARANTEE:

- A. Each manufacturer of the deck equipment shall provide the Owner with a separate written (minimum) one-year warranty against defective materials or workmanship starting on the date of Substantial Completion.

1.5 SUBMITTALS, IN ACCORDANCE WITH THE GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Submit manufacturer's product data, specifications, and installation instructions for each product specified in this Section.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Rails and tubing shall be T316 stainless steel, 1.90-inch O.D. by 0.109-inch wall thickness. All joints to be welded by T.I.G. process, ground smooth. Buffed and polished.
- B. Anchors and escutcheons shall be T316 stainless steel.

2.2 RAILINGS

- A. Railings shall be 1.90-inch O.D., 0.109-inch wall T316 stainless steel buffed and polished.
- B. Shall be custom manufactured by SR Smith or approved equal.
- C. Stainless-steel wedge anchors and escutcheons.

2.3 LADDERS

- A. Ladders shall be 1.90-inch O.D., 0.109-inch wall T316 stainless steel buffed and polished.
- B. Stainless-steel wedge anchors and escutcheons.
- C. Treads shall be integral to the ladder.
- D. Ladders shall extend 6-inches from the wall.

2.4 ADA POOL LIFT

- A. ADA pool lift shall be Model No. Splash! Extended Reach, manufactured by SR Smith or approved equal.
- B. ADA pool lift shall be battery operated.
- C. Provide one (1) caddy, one (1) mast cover, and one (1) spare battery.

2.5 RESCUE AND FIRST AND EQUIPMENT:

- A. Wall Brackets for Rescue Equipment: Provide stainless steel wall brackets for each piece of rescue equipment.
- B. Respirator: Red Cross approved respirator approved by New York State Health Department or Approving Authority.
- C. Refer to Equipment List on Sheet AQ-130 for further items and clarification.

2.6 POOL CLEANING EQUIPMENT:

- A. Provide robotic vacuum cleaner and cart system. System shall have fine and ultra-fine cartridges, 130 FT of cord, 115v. Provide one extra set of each cartridge for that particular unit. Robotic Vacuum Cleaner shall be manufactured by Hayward or approved equal.
- B. Refer to Equipment List on Sheet AQ-130 for further items and clarification.

2.7 SIGNAGE:

- A. Health and Safety signs shall be manufactured from a minimum of ¼-inch composite material, and shall be mounted with 316 Stainless Steel hardware. Lettering shall be a minimum of 1-inch in height, with the “No Diving” 4-inch in height where it is applicable.
- B. Pool signs shall be manufactured by Fossil Industries, Seton, Brady ID, or approved equal.
- C. Signs shall conform to contract documents.
- D. Signage font and color shall be selected by the Architect. Owner’s Representative reserves the right to add any additional language beyond the standard health requirements.

2.8 EMERGENCY PHONE:

- A. Emergency Phone: Provide handset phone with keypad in watertight enclosure. Shall be a lift handset and dial appropriate number. Manufactured by Rath Pool Phones model 624MPOOL, or approved equal.
- B. Phone shall be connected to a phone connection that does not require additional numbers to dial out other than 9-1-1.
- C. An Emergency phone shall be located in the Pool Area as shown on contract documents.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Verify mechanical and electrical rough-in services for sizes, types and locations. Verify adequacy of electrical grounding. Review construction joint locations.
- B. Start of this work constitutes acceptance of substrates as suitable for satisfactory performance of work of this Section.

3.2 INSTALLATION:

- A. Pool and Deck Equipment: Install in accordance with the manufacturers' recommendations. Provide anchors and inserts required in other construction and core drill holes to accept all rails located in pool and epoxy grout to provide secure, durable installations. Ground all metal items electrically to a single pool grounding system per pool.
 - 1. All exposed welds shall be ground smooth and cleaned with all discoloration removed, to provide a smooth, uniform non-corrosive finish matching the basic stainless material. Use grout or sealant only as recommended by manufacturer to maintain service guarantees.

3.3 PROTECTION:

- A. Protection: The Swimming Pool Contractor shall use whatever methods are required to protect pool tank, pool finish and equipment from deterioration during remainder of the construction period.

END OF SECTION 13 11 46